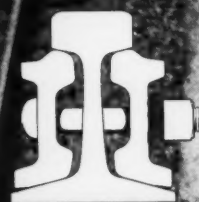


Railway Engineering Maintenance

On thousands and thousands
of miles of well laid track
Improved Hipowers are helping
to do a better job in efficient
maintenance.

**IMPROVED HIPOWERS
IMPROVE TRACK**



Tightness

REALLY COUNTS ON THE CURVES

Twenty-four hours a day . . . 365 days a year . . . passenger and freight trains highball through Ohio over the tracks of the Erie Railroad. Curved track makes scenic right of way, but maintenance-of-way engineers know the stress, strain and extra wear that heavy loads develop on curves. This requires reliable always-tight rail joint assemblies.

That's why you'll find Reliance Hy-Pressure Hy-Crome Spring Washers specified for most rail joint assemblies. Where constant steady tension is required Reliance Hy-Pressure Hy-Crome Spring Washers meet the demands. This washer is designed especially for rail joint assemblies where its inherent reactive values compensate for inevitable looseness resulting from wear.

The non-fatiguing Reliance Hy-Pressure Hy-Crome Spring Washers hold vital rail joint assemblies **TIGHTER LONGER** and keep traffic moving by maintaining trouble free track, even on curves where the impact is toughest.



*Edgemark
of Quality*

EATON

EATON MANUFACTURING COMPANY

OFFICES AND PLANT MASSILLON, OHIO

Reliance Division

Send today for illustrated folder of the Reliance Hy-Crome Spring Washer for track applications, showing how Reliance Washers keep tension there in spite of wear.

The **WEDGE** for *Tightness* The **SPRING** for *"Give"*

*These 7 POINTS
mean real bracing*

1 Wedge. Brinell hardness of about 400.

2 Two pawls (forgings) with synchronized action.

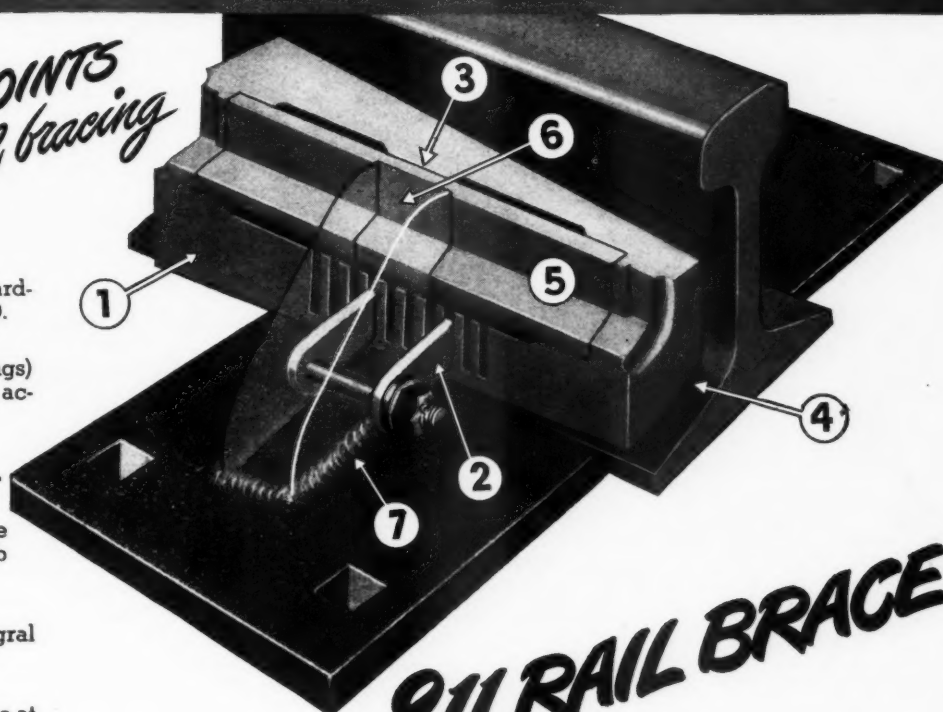
3 Compression stop.

4 Contours of wedge fit base and web of rail.

5 Steel spring, integral with wedge.

6 Thick, heavy brace at right angles to plane of contacting surface.

7 Switch plate and brace welded together.



811 RAIL BRACE

Bethlehem's 811 Rail Brace is a simple device that presents no installation problems. Yet, despite its simplicity, this heavy-duty brace has many features that are real trouble-savers.

One is the wedge, a heat-treated forging that lies snugly against the rail flange and web. It is easily adjustable to provide a tight, rigid fit and compensate for differences in rails. Synchronized pawls on the brace engage slots in the wedge . . . so that it always "stays put."

Another feature, providing for resiliency and recovery from side thrust, is the rugged steel spring. This piece is integral with the wedge proper. It will withstand a compression force of at least 20,000 pounds.

Here's a brace that combines exceptional strength with a definite cushioning action. For further details, write Bethlehem Steel Company, Bethlehem, Pa., or the nearest District Office.



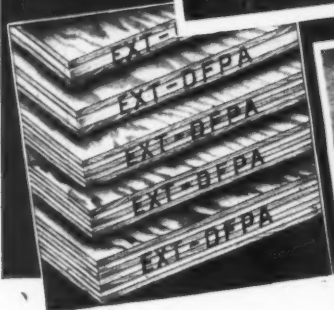
Exterior Type Douglas Fir PLYWOOD

(Made with Completely-Waterproof Binder)

— **laboratory tested for weatherproof qualities**



• Just a month in this "Weather-O-Meter" produces the effect of a year of sun and rain on finishes for Douglas Fir Plywood. These tests—carried on in the Douglas Fir Plywood Association laboratory—augment findings from test exposure fences in climatically different parts of the country, and from actual uses all over the world. This research laboratory tests more than 150,000 Plywood samples each year, in addition to developing new products and new uses.



Always Look for The EXT-DFPA "Grade Trade-Mark"

• Exterior type Douglas fir plywood is made with completely waterproof synthetic resin binder especially for permanent exposure to weather and water. It must be specified for all exterior applications, for interior use where moisture conditions are abnormal. Every panel carries the EXT-DFPA "grade trade-mark"—your assurance of thoroughly tested weatherproof qualities!



• Exterior type Douglas fir plywood provides a tight, durable, weatherproof siding for 50-ton Great Northern box cars (top inset). Tests proved the cars sturdy, durable and much lighter than conventional cars. Plywood was used for interior sheathing, too (bottom inset). The large panels speed construction and reduce costs — are split-proof, puncture-proof, light in weight and easy for workmen to handle.

Railroads, too, have proved Exterior Plywood's durability

• Not only laboratory-tested—but thoroughly proven in actual use—Exterior type Douglas fir plywood is one of the most versatile materials for railroad construction. It is strong and durable — **engineered** for strength. It is made with completely waterproof synthetic resin binder especially for permanent exposure to weather, water and all abnormal moisture conditions.

• Exterior type plywood makes possible tighter, stronger, lighter construction when used in cabooses, box cars and reefers. Thousands of such cars are today providing exceptional service on scores of lines. Plywood has many general construction applications, too—in depots, freight sheds, maintenance buildings and warehouses.

• Douglas Fir Plywood Association engineers will be glad to work with you in solving specific construction problems through the use of this strong, rigid, durable material. Write or wire.

Douglas Fir Plywood Association

Tacoma 2, Washington

FOR PRICES AND DELIVERY INFORMATION

SEE YOUR SOURCE OF SUPPLY

FLEX-TOE



Pull Spikes Like This One

CLAW BARS



THE DEMAND INCREASES!

The fact that Flex-Toe claw bars have met public favor is a matter of record. The increased demand results from new customers—also from older customers who are buying additional Flex-Toes for more universal use on their roads.

This tool eliminates spike maul driving; fewer hands pull more spikes . . . ordinary spikes, headless spikes, stubs, brine-eaten spikes, drift bolts, boat spikes come out easily. The tighter the pull on the handle, the tighter Flex-Toe holds.

Your men throw the Flex-Toe claw bars onto spikes just the same as they do an AREA bar. They lift the handle slightly, then come down—and as they do, the bar grips and cracks the spike easier than with any other bar. No hammering . . . no frequent lifting and jerking! Flex-Toe is the safest-to-use claw bar made.

WARREN TOOL CORP.

WARREN • OHIO

General Sales Offices:

105 W. ADAMS ST. • CHICAGO, ILL.



SIMPLE, FOOLPROOF ASSEMBLY

Toes are sharpened by a little bit of filing. When they become worn beyond repair, you don't buy a new bar as with the AREA bar . . . just order new toes at small cost . . . you save plenty. The new toes are easily assembled into the yoke.

WARREN TOOL CORP. • WARREN, OHIO

Send literature and prices _____

Name of road _____

Your name _____

Title _____

Address _____

City _____ State _____



Pipe Cleaning TOO, IS AN *Art*



Like properly putting paint on a canvas, cleaning pipes thoroughly is an art. To clean pipes correctly and economically the first time requires knowledge, skill, tools and expert engineers. All of these advantages are available from Pittsburgh Pipe Cleaner Company to help your railroad gain the full value of free flowing pipes and sewers.

Clean pipes mean increased pressure, greater flow and better service with lower operating and maintenance costs, so bring your problems to Pittsburgh's experts.

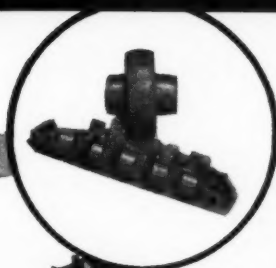
Send today for information about our complete contract pipe and sewer cleaning services.

PITTSBURGH PIPE CLEANER CO.

133 DAHLEM STREET PITTSBURGH 6, PENNA.

**PITTSBURGH, PHILADELPHIA, BALTIMORE, WASHINGTON, NEW YORK
BUFFALO, CHICAGO, CINCINNATI, ST. LOUIS, DETROIT**

The crawler for those difficult off-the-line jobs!



Tread and roller detail showing ball and socket action.



Treads are equipped with lugs on alternate sides. This eliminates pockets that can collect materials and provides a self-cleaning action.

7 HERE is no other crawler like this! The crawler base bed is a heavy annealed steel casting, assuring a strong rigid foundation. All travel gears are fully enclosed and run in oil. Alternate lugs on tread shoes give a self-cleaning action. A ball and socket action between roller and tread distributes the bearing pressure more evenly.

Joints between treads are closed eliminating "nut cracker" action that picks up stone and trash and catches on rail.

Half-length floating pins simply locked in, reduce wear and replacement in tread shoes. And, most important of all—positive traction on both crawler belts while turning as well as when going straight ahead, on all larger Northwests, assures full traction when you need it most.

Here is an all weather machine for either on-the-line or off-the-line jobs. Let us give you details on the size machine you need.

NORTHWEST ENGINEERING COMPANY
1713 Steger Bldg., 28 E. Jackson Blvd., Chicago 4, Illinois

**YOU CAN'T
DO THIS
WITH A TRACK
CRANE**

NORTHWEST

**PROVED
on the nation
LEADING
RAILROAD**



Six Old Timers from the

CORRUGATED TRANSITE



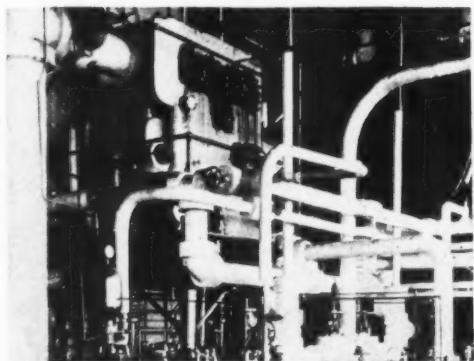
20 Years of Service—Twenty years ago, the engine house, power plant and small auxiliary buildings in this yard were sheathed with Johns-Manville Corrugated Transite, the asbestos-cement building material that cannot burn, rot or corrode. Today, there is no sign of deterioration, and maintenance has been negligible.

BUILT-UP ROOFING



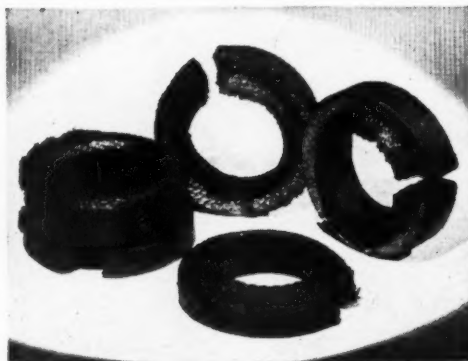
32 Years of Service—One of many "old timers" among J-M Smooth-surfaced Asbestos Built-Up Roofs on railroad buildings, this one has been in service since 1914. Although constantly exposed to destructive engine-house gases, as well as extremes of heat and cold, it is still in sound condition. Maintenance: none whatever.

INSULATION



23 Years of Service—For 23 years, Johns-Manville Insulations have conserved fuel in this large railroad power plant—with no loss in thermal efficiency. Considering the size of the installation (nearly 1800 lineal feet of pipe covering alone) maintenance has been exceptionally low—less than an average of \$10 per year.

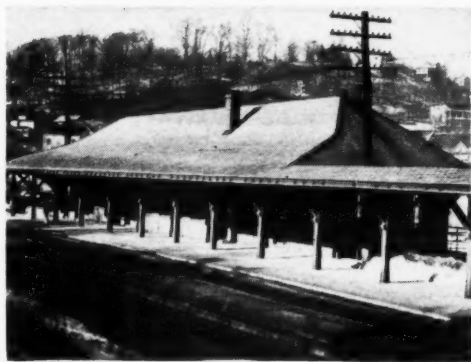
PACKING



22 Years of Service—Shown above is a set of Johns-Manville Sea Rings just as they looked after a 22-year "tour of duty." During that time, they were in continuous operation 14 hours per day on an Ingersoll Rand air compressor. Note the slight amount of wear—evidence that these packings were still good for further service!

Johns-Manville Album

ASBESTOS SHINGLES



32 Years of Service—Since 1914, Johns-Manville Asbestos Shingles have withstood summer's heat and winter's snow and ice on the station roof above. And these fireproof, rotproof shingles are still as serviceable as ever. On hundreds of railroad buildings, they are providing this same maintenance-free performance.

ASPHALT TILE FLOORING



18 Years of Service—The floor of Johns-Manville Asphalt Tile in this railroad Y.M.C.A. has taken a severe beating. Heavy work shoes carrying cinders, dirt, snow and mud have scuffed at it for 18 years. Yet it is still in good condition—and except for cleaning, not one cent has ever been spent for maintenance or repairs.

THE six Johns-Manville installations pictured—a few of many "old timers" in our files—have a combined length of service of 147 years. And except for the Sea Rings, which have been "retired" after 22 years of continuous operation, all are still on the job!

Such performance is not unusual. Rather, it is the kind of service America's railroads *take for granted* from these and other Johns-Manville asbestos products. By insuring long-term protection to buildings and equipment . . . by reducing "time out" for repairs . . . and by eliminating frequent replacements, they contribute to low maintenance in every department of railroad operation.

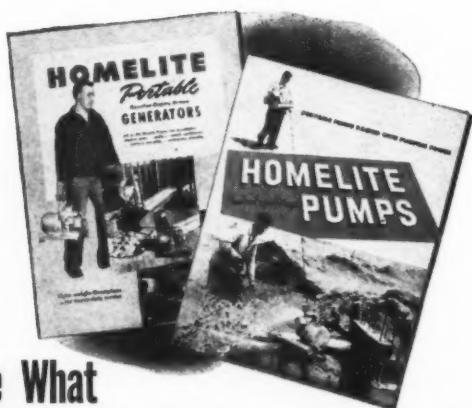
For complete details, write Johns-Manville at New York, Chicago, Cleveland, St. Louis or San Francisco.



JOHNS-MANVILLE

88 YEARS OF SERVICE TO TRANSPORTATION

Insulation • Friction Materials • Packings • Refractory Cements • Building Materials



See What HOMELITE Portable Pumps and Generators will do On Paper

Two new bulletins . . . L501 on Homelite Portable Pumps and L406 on Homelite Portable Generators . . . will bring you up-to-date on all the latest developments in Homelite design and performance. Send for these two bulletins. Look them over carefully. *But don't stop there.*



then
on the job



see what they'll do

Homelite Representatives, now located in strategic centers throughout the country, are ready to give actual on-the-job demonstrations of Homelite pump and generator performance. Let them give one for you. Let them show you all the pumping qualities of Homelite Portable Pumps. Let them show you the new Homelite Portable Generators in action . . . running floodlights or all kinds of electric tools . . . on *your* job, any place, any time. Simply write.

HOMELITE

CORPORATION
Portable Pumps, Generators, Blowers
PORT CHESTER, NEW YORK

BRANCH OFFICES

Albany, N. Y.	Chicago, Ill.	Hartford, Conn.	Orlando, Fla.
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C. H. Koenig Equip. Co.	George F. Hastings	The Midwest Equip. Co.
Canadian Representative: Terry Machinery Company Ltd.		

Let's take a Look at the Record -

During the 35 years we have been serving railroads, our facilities have developed to enable us to render nation-wide service. The emblems below indicate some of the railroads regularly using our chemicals for weed control work.

This representative group is evidence of the widespread acceptance of our weed killer products.



Sprayed with

ATLACIDE
CHLORATE WEED KILLER

and

ATLAS "A"
ARSENICAL

CHIPMAN CHEMICAL COMPANY, INC.

Chicago, Ill.

BOUND BROOK, N. J.

Houston, Tex.

Palo Alto, Calif.

No. Kansas City, Mo.

Portland, Ore.

Over Thirty-five Years of Weed Control Service

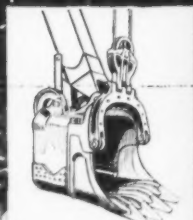
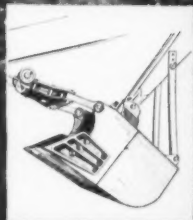
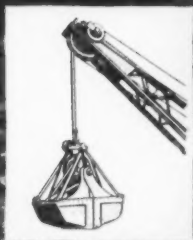
"Off-the-Track" EQUIPMENT Pays Off!

LINK-BELT SPEEDER DOES MORE WORK...

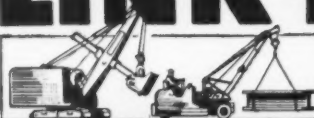
MORE KINDS OF WORK...MORE OF THE TIME!

On the line, Link-Belt Speeder crawler-mounted machines perform routine or emergency jobs with ease, speed and abundant power. Quickly convertible to shovel, crane, dragline or pile driver, their wide utility matches the endurance and trouble-free operation designed and built into them—and which railroaders especially appreciate. In yards, stores and repair shops, the wheel-mounted Cargocrane is indispensable for lifting and carrying loads up to 10 tons.

10,228



LINK-BELT SPEEDER



Builders of the Most Complete Line of
SHOVELS-CRANES-DAGLINES



LINK-BELT SPEEDER CORPORATION, 301 W. PERSHING ROAD, CHICAGO-9, ILL.
(A DIVISION OF LINK-BELT COMPANY)

Leading Roads
are using
more and more
BARCO
TYTAMPERS

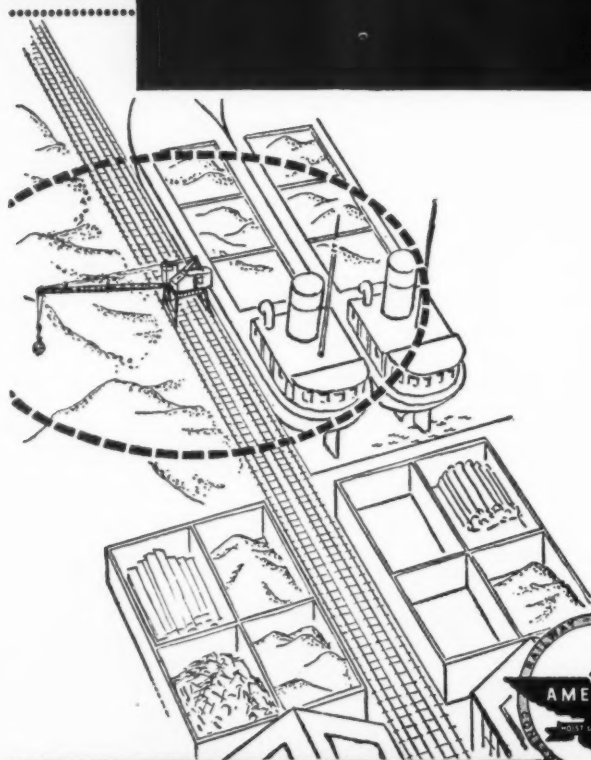


BARCO UNIT
TYTAMPERS

ON THE VITAL JOB of keeping right-of-ways in prime condition, Barco Unit Tytampers are finding ever-increasing favor. Leading railways recognize the importance of trackage maintenance...find in Barco a practical, reliable, economical tool for this work. Workers like it too...because a Barco is light, easy to handle, simple in design. For full information, write Barco Manufacturing Co., Not Inc., 1805 Winnemac Ave., Chicago 40, Ill.



manpower: $\frac{3}{100}$ ths. of 1%



Just $\frac{3}{100}$ ths of 1% of this huge capacity materials-handler — 175 lbs. — is man. The rest is machine — efficiently applying its Diesel (or electric) power in highly synchronized movements.

How can you best apply this high ratio of machine power to manpower in your operations?

These "American Revolver" Cranes do many types of work — hook, clamshell, magnet — and do it effectively. They can be mounted on high or low, stationary or self-propelled gantries. Stationary types are also used on barges and boats. They serve areas up to 300 feet across; and mounting the machinery deck as a trolley on a wide gantry bridge increases this width still further. Car-pulling attachments are also available.

Catalog 400 will give you complete specifications.

American

HOIST & DERRICK CO.

St. Paul 1, Minnesota

CHICAGO

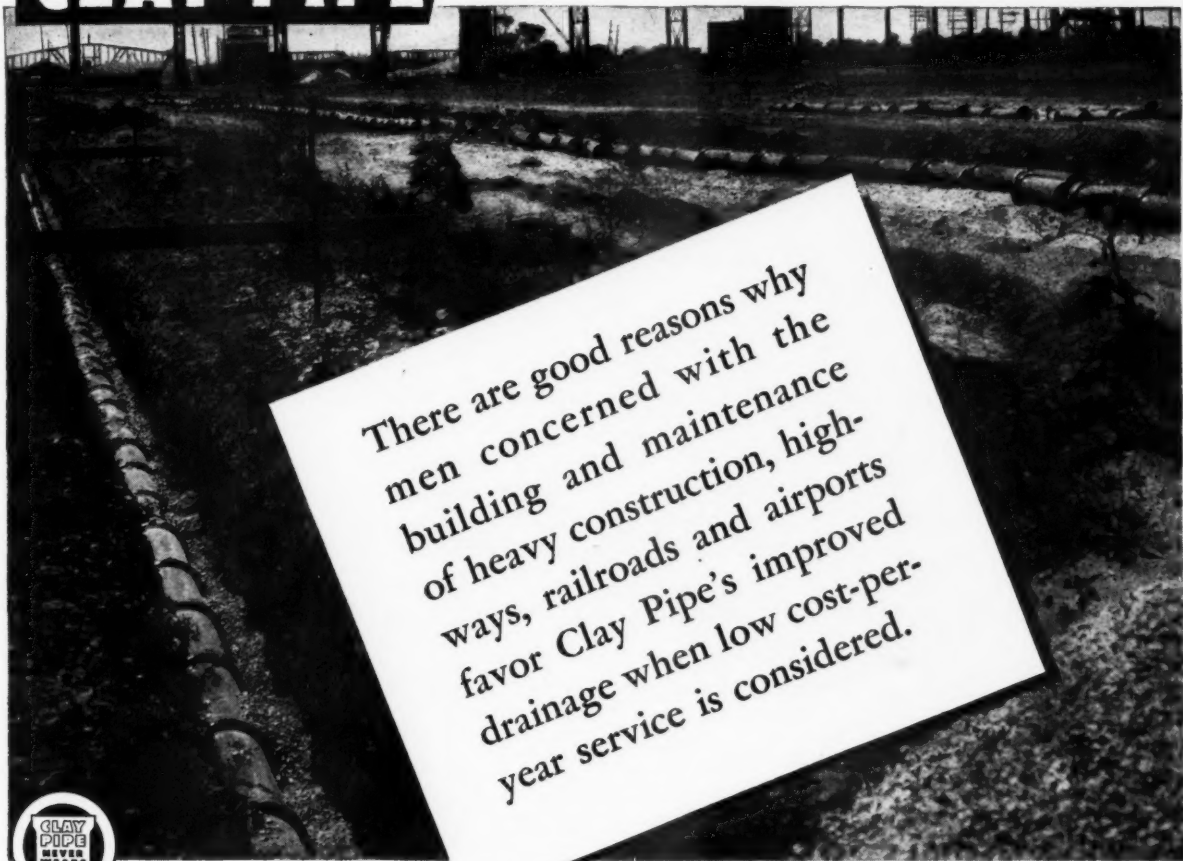
SAN FRANCISCO

NEW YORK



Specify **CLAY PIPE**

FOR LOW COST-PER-YEAR RAILROAD DRAINAGE



There are good reasons why men concerned with the building and maintenance of heavy construction, highways, railroads and airports favor Clay Pipe's improved drainage when low cost-per-year service is considered.



Clay Pipe does the job right, and lasts longer than any other material . . . because it never wears out. Enduring clay, shaped under great pressure and vitrified at fusing temperatures, produces the hard, strong, finished pipe that has no equal. Properly installed Clay Pipe does not require periodic or frequent replacement. It defeats corrosion, crumbling and rust problems that make other drains short-lived.

And for extra-heavy live or static loads where vehicles roll and planes land, where the back-fill is unusual or the trench shallow, where it is desirable to eliminate or reduce cradling or casement costs . . . Extra-Strength Clay Pipe does an outstanding job.

For information or engineering literature from one of the regional association offices, write to:

National Clay Pipe Manufacturers, Inc.
111 W. Washington St., Chicago 2, Ill.



**GORMAN-RUPP PUMPS
WILL OUTPERFORM
AND OUTLIVE
OTHER EQUIPMENT**

*---here are some
reasons why*

You can't get the real story of a Gorman-Rupp pump from looking at the outside. It's the simplicity and good design inside that makes this the most efficient, trouble-free pump you can get. *There are no by-passes, no pipes, no valves - nothing to do in priming but start the motor and you start the water. Since such makeshifts rob a pump of as much as 30 per cent of its running capacity, the greater priming simplicity of Gorman-Rupp pumps pays off in more work for less fuel and power.

*Gorman-Rupp pumps are streamlined inside where streamlining counts! Smooth surfaces, no traps and a design that flows with the water adds another big factor to efficiency and prevents clogging. These pumps will handle any muck or

solids that will pass the intake and clear them out of the pump body.

*The G-R impeller operates at motor speed, without reduction gears - another source of wear, trouble and maintenance eliminated. This impeller is the only moving part and rotates on high grade roller bearings.

*Every part of a Gorman-Rupp pump has long wear built into it, and every wearing part is replaceable without tearing the pump apart. This maintenance can be done by an unskilled man with common tools.

These are a few reasons why Gorman-Rupp self-priming centrifugal pumps will out-perform and outlive any other comparable equipment. Write for further detailed information.



THE GORMAN-RUPP COMPANY

332 BOWMAN STREET • MANSFIELD, OHIO

SEE FAIRBANKS-MORSE FIRST ^{FOR} MOTOR CARS

What are your primary motor car requirements? Power? Safety? Portability?

If the features you want built into a motor car are stamina, safety, and light weight, then check with Fairbanks-Morse Motor Cars. You will agree they will give you the service you are looking for.

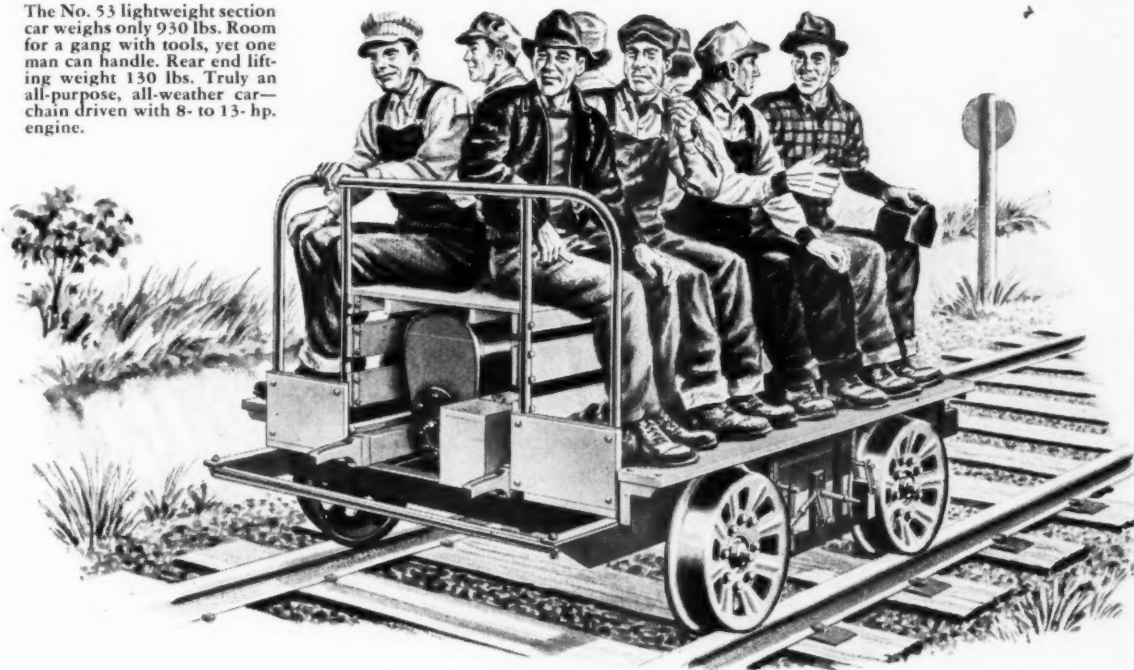
Here is needed power for grades and curves . . . rugged construction for maximum safety at straightaway speeds . . . light weight for easy handling.

Moreover, here are proved dependability and economy of operation that mean savings in maintenance time and dollars.

Signal maintainers, section or bridge gangs, track inspectors, roadmasters, etc., have used Fairbanks-Morse Motor Cars for over 50 years. Profit by their experience and make your motor car investment count . . . specify Fairbanks-Morse!

Fairbanks, Morse & Co., Fairbanks-Morse Bldg., Chicago 5, Illinois.

The No. 53 lightweight section car weighs only 930 lbs. Room for a gang with tools, yet one man can handle. Rear end lifting weight 130 lbs. Truly an all-purpose, all-weather car—chain driven with 8- to 13-hp. engine.



Fairbanks-Morse

A name worth remembering



Diesel Locomotives • Diesel Engines
Scales • Motors • Pumps • Generators
Magnetos • Stokers • Railroad Motor
Cars and Standpipes • Farm Equipment

HOW TO GET

BRASS

MILL PRODUCTS!

BRASS, BRONZE AND
COPPER... Rod, Bar,
Sheet, Strip, pipe,
tubing, and wire
in Production
Quantities.

GOVERNMENT-OWNED SURPLUS STOCK

in many standard and non-standard grades,
finishes, sizes and specifications AVAILABLE NOW
in production quantities

—and new surplus declarations are being made daily.

EASY TO FABRICATE...
This stock may be fabri-
cated by normal pro-
duction methods.

HOW TO PURCHASE

- 1 Estimate, for any convenient period, your production needs in each specification, finish, gauge, etc.
- 2 Write, wire or phone that information to your nearest War Assets Corporation office* below. We will advise you of the location and condition of the stock you need, estimate possible delivery dates, quote prices and help arrange credit.
- 3 When satisfactory arrangements have been made, we will start shipments.

*WAR ASSETS CORPORATION is a Reconstruction Finance Corporation subsidiary.
When checking telephone and other directories, simply look up RFC.

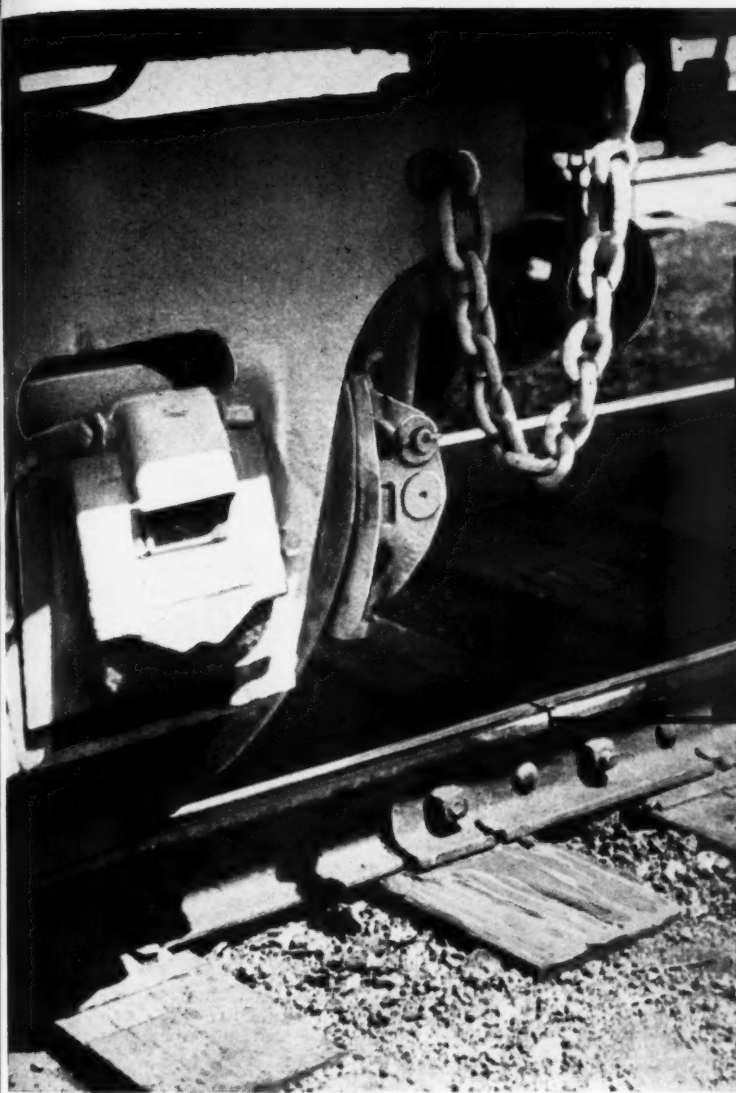
VETERANS OF WORLD WAR II: To help you in purchasing surplus property from War Assets Corporation, a veterans' unit has been established in each of our Regional Offices listed below.

A DISPOSAL AGENCY DESIGNATED BY THE SURPLUS PROPERTY ADMINISTRATION for Surplus Producers' and Capital Goods, Aircraft and Plants formerly handled by Reconstruction Finance Corporation... and for Surplus Consumer Goods formerly handled by United States Department of Commerce.

WAR ASSETS CORPORATION

(A SUBSIDIARY OF RECONSTRUCTION FINANCE CORPORATION)

RFC OFFICES (INCLUDING FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES) LOCATED AT: Atlanta • Boston • Chicago • Denver • Kansas City, Mo. • New York • Philadelphia • San Francisco • Seattle • OTHER RFC SURPLUS PROPERTY OFFICES LOCATED AT: Birmingham • Charlotte • Cleveland • Dallas • Detroit • Helena • Houston • Jacksonville • Little Rock • Los Angeles • Louisville • Minneapolis • Nashville • New Orleans • Oklahoma City • Omaha • Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • Spokane • OTHER FORMER DEPARTMENT OF COMMERCE REGIONAL SURPLUS PROPERTY OFFICES LOCATED AT: Cincinnati and Fort Worth



BUILT-UP RAIL ENDS INCREASE RAIL LIFE

● Building up battered rail ends with OXWELD MW welding rod increases the life of rail in first position from 50 to 100 per cent. Rail ends built up with this rod provide an armored surface that is more batter-resistant than the original rail metal. Worn rail and trackwork which has been restored to a true-riding surface results in reduced wear on ties, joint bars, and rolling stock. The work may be done in track with no interruption to traffic.

Ask an Oxweld representative to tell you about this and other cost-saving maintenance methods.



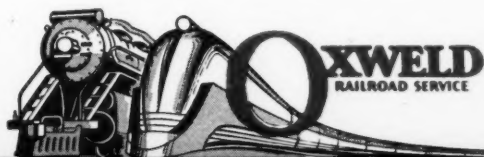
"His rail end, built up by Oxweld's method, has a hard, smooth surface."

The word "Oxweld" and the designation "MW" are registered trade-marks of Union Carbide and Carbon Corporation.

THE OXWELD RAILROAD SERVICE COMPANY
Unit of Union Carbide and Carbon Corporation



Carbide and Carbon Building Chicago and New York





Red Lead "Soaps"

help make Paint Film Tough...Flexible...Water-Resistant

While maintenance engineers know, by long experience, that Red Lead helps *make metal last*... and widely accept it as the standard metal protective paint... it remained for modern science to show exactly *why* Red Lead so effectively inhibits rust.

One of the important reasons is Red Lead's ability to react with the vehicle, and produce unique lead "soaps."

These soaps grow to form a tough, impervious, intermeshing matrix within the paint film, as shown in the photomicrograph at right.

The soap formations increase Red Lead's protective power in several ways. For one thing, they *mechanically* reinforce and toughen the paint film.

At the same time they contribute all-important flexibility, allowing movement all along their soft, intertwining projections. This helps prevent the ruptures to which a hard unyielding film is subject.

Moreover, lead soaps slowly form primarily in the dry paint film as it ages. This is where the soap formations impart their greatest benefits. When a paint film weathers and ages, decomposition products of the vehicle are formed. Red Lead's ability to slowly combine with these decomposition products actually enhances the life of the paint film. Red Lead's slow rate of reaction means the film age-hardens at a slower rate. It thus retains a high degree of flexibility, a great factor in its lasting adhesion.

And again, the very structural formation of the soaps, with their dense, impermeable matrix of interwoven fibres, helps to restrict the passage of moisture through the paint film. Metal cannot rust without the presence of moisture.

Specify RED LEAD for ALL Metal Protective Paints

The value of Red Lead as a rust preventive is most fully realized in a paint where it is the only pigment used. However, its rust-resistant properties are so pronounced that it also improves any multiple pigment paint.

No matter what price you pay, you'll get a better paint for surface protection of metal if it contains Red Lead.

This photomicrograph shows the distinctive lead soap formations resulting from Red Lead's reaction with the vehicle. Note how the rod-like projections, radiating from central cores, spread out and intermesh. This makes a strong, flexible, interwoven structure, just as individual fibres in a piece of cloth are woven to make the cloth strong and durable. This type of soap formation is unique with lead paint films.



Here you see the standard apparatus used for measuring the water permeability of paint films.

With this equipment a measure of the amount of water that passes through a unit of film is obtained.

Experiments show that a straight linseed oil film allows three times as much water to pass through the film as when the same film is pigmented with Red Lead... illustrating once more the beneficial protective action of Red Lead and Red Lead "soaps."



Write for New Booklet—"Red Lead in Corrosion Resistant Paints" is an up-to-date, authoritative guide for those responsible for specifying and formulating paint for structural iron and steel. It describes in detail the scientific reasons why Red Lead gives superior protection. It also includes typical specification formulas. If you haven't received your copy, address nearest branch listed below.

The benefit of our extensive experience with metal protective paints for both underwater and atmospheric use is available through our technical staff.

NATIONAL LEAD COMPANY: New York 6; Buffalo 3; Chicago 80; Cincinnati 3; Cleveland 13; St. Louis 1; San Francisco 10; Boston 6; (National Lead Co. of Mass.); Philadelphia 7; (John T. Lewis & Bros. Co.); Pittsburgh 30; (National Lead Co. of Pa.); Charleston 25, W. Va.; (Evans Lead Division.)



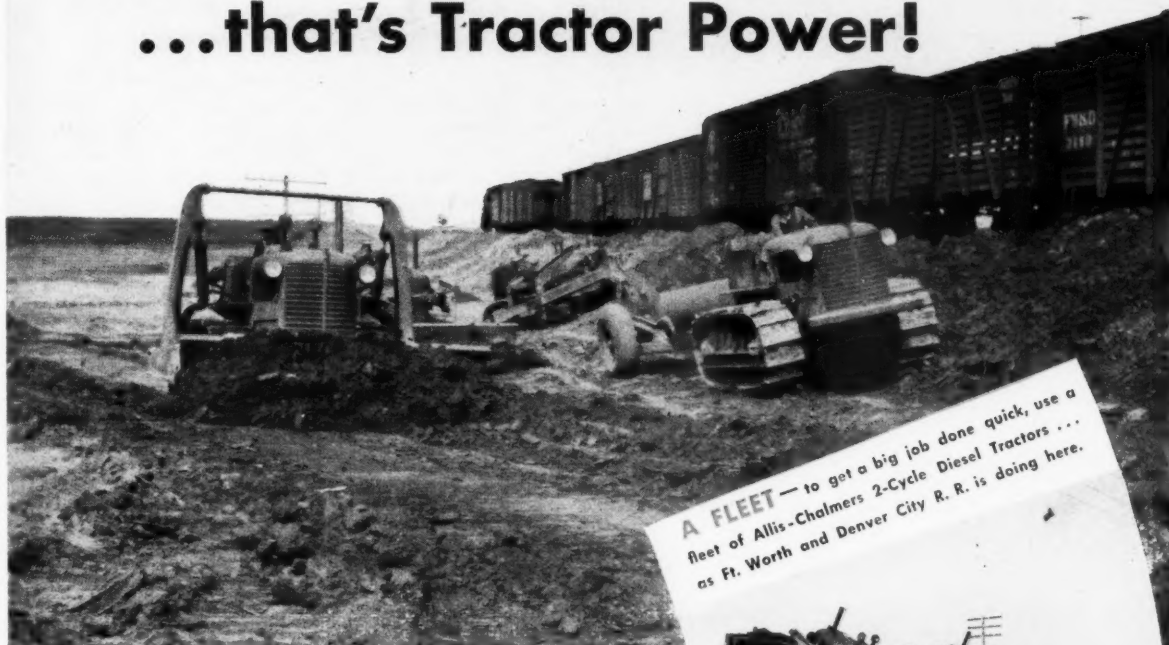
Dutch Boy

Reg. U. S. Pat. Off.

Red Lead

FLEXIBLE

...that's Tractor Power!



A FLEET — to get a big job done quick, use a fleet of Allis-Chalmers 2-Cycle Diesel Tractors ... as Ft. Worth and Denver City R. R. is doing here.

Allis-Chalmers Diesel tractors go where you want them to go...do what you want them to do. Powerful, fast-workers, they handle any grading or maintenance...put in a full day every day. Work free of the tracks—they don't interrupt traffic and traffic doesn't interrupt them.

You also can assign the right amount of power to each job—further reduce cost. Put a fleet on a big, hurry-up project...one or two on regular work. There's further flexibility in your choice of auxiliary equipment—use them with bulldozers, 2- or 4-wheel scrapers, front-end loaders, graders, rippers or sheepfoot rollers.

Yes, tractor power is flexible power. Your Allis-Chalmers dealer will gladly give you full information.



A TEAM — you can build-up slopes twice as fast by teaming-up Allis-Chalmers Diesels.

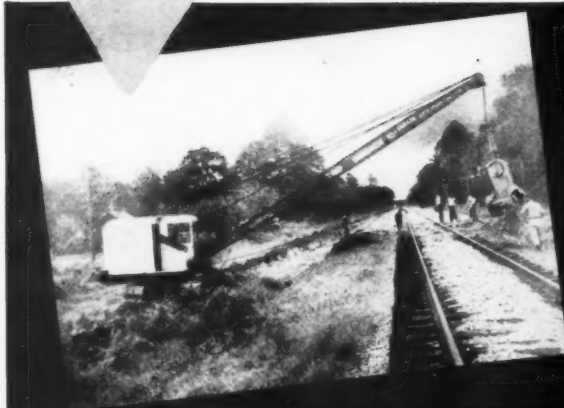


ALONE — the ideal, all-round worker is this Allis-Chalmers Diesel with bulldozer and 2-wheel scraper—hauls and end-dumps dirt...levels, slopes.

ALLIS-CHALMERS

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Check...on all handling jobs



CRAWLER—The crawler mounting won't travel your unit as fast as "rubber" mounting, but you can bet it will take your machine anywhere you need it—over toughest going and up steep grades. Lorain Crawlers provide 2 speeds both in forward and reverse. Operator can steer in either direction or pivot turn with the turntable swing in any position. With a Lorain Crawler you have power and tractive effort combined with usual maneuverability.

MOTO-CRANE—Lorain Moto-Cranes, with their high mobility, are ideal for serving big areas and widely separated variable jobs. These are rubber-tired, two-engine units. Turntable unit powers all shovel-crane operations. The chassis engine propels the entire unit—up to 30 M.P.H. on the road—and with ample low-speed power for off-the-road going or heavy tows, moving cars, equipment, etc. Six wheeler units, with choice of 4-wheel or 6-wheel drive.



SELF-PROPELLED—In this popular unit a single engine powers all shovel-crane operations and also propels the entire unit up to 7 1/2 M.P.H. This economical unit is especially engineered for localized on-the-job mobility. Six wheeler unit, 4-wheel drive, rubber-tired. All Lorain Self-Propelled units provide a big capacious utility platform.



Front end interchangeability of *all* Lorain Shovel-Cranes makes them quickly adaptable for: Handling Rails and Frogs; Fueling and Auxiliary Coal Storage; Cleaning Ash Pits; Handling Scrap; Storekeepers Yard and Road Service; Cleaning Ditches; Cleaning Ballast; Team Track Service; Heavy Lifts of all kinds; Bridge and other construction.

Reg. Trade Mark
thew Lorain

THE
THEW SHOVEL COMPANY
LORAIN, OHIO

CRANES • SHOVELS • DRAGLINES • MOTO-CRANES

HERE'S A *NEW* PLATFORM MATERIAL

WITH NEW SERVICE POSSIBILITIES

KOPPERS ASIDBAR *

The terrific beating that platform flooring has to take means early deterioration for ordinary materials, and many engineers accept frequent replacements as a necessary evil.

Such replacements aren't necessary . . . now. An important new Koppers development fortifies wood against failure, greatly extends the useful life of the floor.

The material is "Asidbar"—wood processed to obtain deep

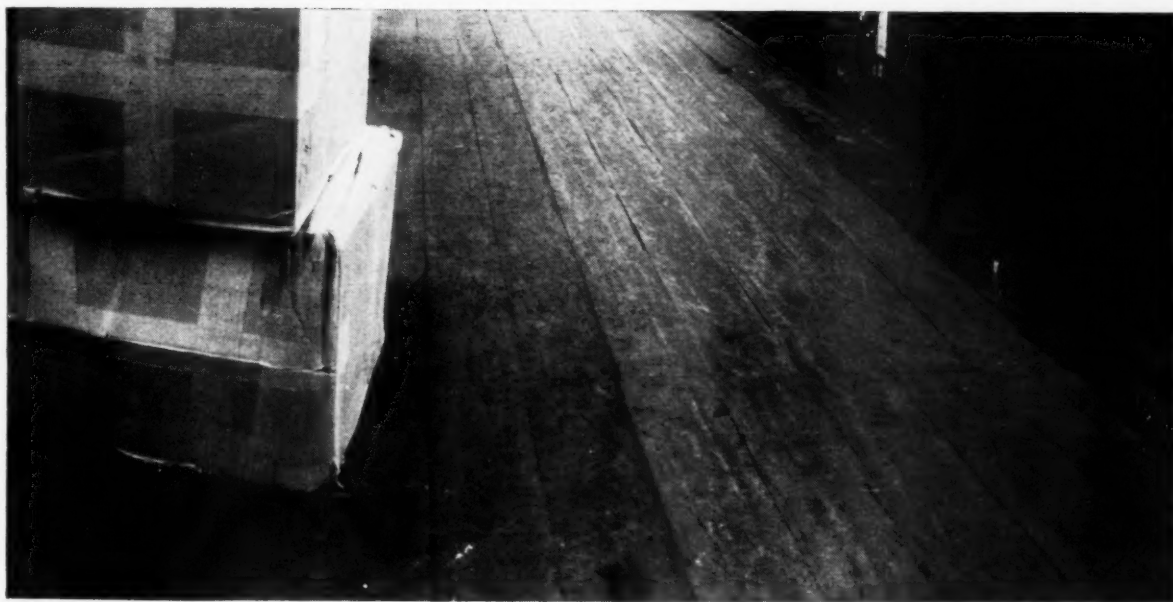
*Trade Mark

penetration and distribution of a special bituminous compound. The injected material coats and fills the fibers to a considerable depth in thick members, and throughout in pieces of moderate cross-section. Both surface and interior wood fibers are protected against deterioration, absorption of moisture is reduced, and decay is combated. The wood can be worked with ordinary tools, and is dry at ordinary temperatures.

In addition to its wear-resistant qualities, Asidbar has some important advantages in special applications. Its resistance to the attack of many acid solutions and corrosive vapors recommends it for platforms, stairs and floors in areas exposed to such conditions.

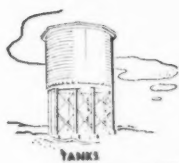
We will be glad to give you information on Asidbar. Just drop us a line. Wood Preserving Division, Koppers Company, Inc., Pittsburgh 19, Pennsylvania.

Asidbar flooring (lighter colored) still good after an extended period of punishing service.



PRESSURE-TREATED WOOD

a KOPPERS Product



*"FLINTKOTE PRODUCTS...
...sure they're my kind!"*

... not a weak sister in the whole line. Take their Car Cements and Protective Coatings, for instance. We've been short-handed here ... had to skip a few shop-pings, but even so there isn't a sign of peel-ing or rusting on any of those gondolas where Flintkote Coatings were used.

And look at that signal tower. Trains have been blowing smoke and cinders at it 24 hours a day for two years, but I couldn't find a bare metal spot on it any-where. These modern Flintkote industrial asphalts sure can take it.

* * *

Flintkote offers a wide range of Railroad

Products for the protection and restoration of railway structures and rolling stock, as well as Flooring Emulsions for heavy-duty mastic floors ... adhesives ... insulation coatings ... pipe and cable coatings ... non-slip floor sur-facing ... waterproofing and dampproofing specialties ... and a complete line of building materials.

Field engineers, backed by Flintkote's 45 years of experience, will be glad to help you determine the most efficient solution to any problem involving these materials and appli-cations.

Send for "Modern Asphalt for Railroads" and get the whole story on these Flintkote products for maintenance and new construction.

Flintkote-Products for Industry

THE FLINTKOTE COMPANY · INDUSTRIAL PRODUCTS DIVISION
ATLANTA · BOSTON · CHICAGO HEIGHTS · DETROIT · LOS ANGELES



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NEW ORLEANS · WASHINGTON · TORONTO · MONTREAL

Always ready to go -



on TIMKEN BEARINGS

Fairbanks, Morse & Co. know the value of Timken Tapered Roller Bearings in section cars — and have for 22 years, being one of the first manufacturers to adopt them.

They know that Timken Bearings assure faster, smoother running; maintain wheel gauge; reduce wheel breakage; prevent axle wear; give full protection against radial, thrust and combined loads; and simplify lubrication.

They have proved that Timken Bearing Equipped cars possess greater availability for service; last longer; cost less for operation and upkeep — and so have their users.

Specify "Timken Bearing Equipped" when buying new inspection and section cars. Make sure the trade-mark "TIMKEN" appears on every bearing that goes in the cars you manufacture. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

For low cost maintenance!

SPRAY YOUR WEEDS AWAY!



2-4Dow Weed Killer

kills weeds easily - completely - chemically

2-4 Dow offers you all these advantages:

- ✓ Harmless to ordinary grasses
- ✓ Higher selectivity—kills more weeds
- ✓ Easier and safer to handle
- ✓ Noncorrosive to spraying equipment

At last—an easy, *chemical* way to kill weeds. Simply spray the tops with 2-4 Dow Weed Killer and kill roots and all! It's a low cost treatment that eliminates your weed problems—and the tiresome job of hand digging and hoeing. Does not harm common grasses when used as directed.

2-4 Dow Weed Killer is the tested product you've been reading about. Use it wherever weeds must go so grass can grow—lawns, parks, playgrounds, golf courses, cemeteries and airfields. And for better maintenance—along highways, railroads and utility lines. 2-4 Dow Weed Killer is available in both powder and liquid form. It comes conveniently packed in sizes for every need.

See Your Dealer or Write Direct!

And ask about other selective weed killers for specific purposes, soon to be announced.

AGRICULTURAL CHEMICAL DIVISION

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis
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**CHEMICALS INDISPENSABLE
TO INDUSTRY AND AGRICULTURE**



POWER PLANTS



ROUNDHOUSES

FOR ANY STEAM LINE...
IN ANY PLACE...ON ANY
RAILROAD PROPERTY
APPLY...

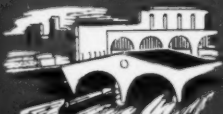


UNIBESTOS

THE SECTIONAL PIPE INSULATION



TRAIN SHEDS



TERMINALS



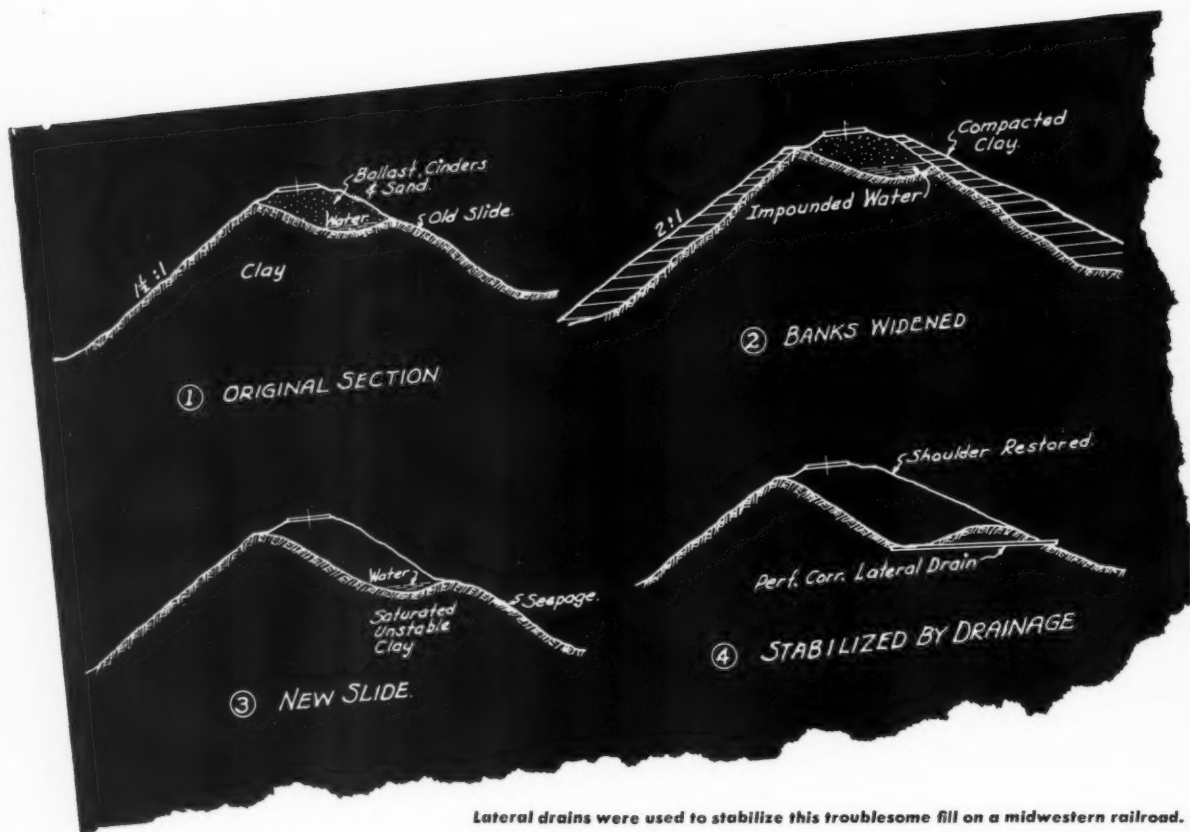
OFFICE BUILDINGS

Conserves fuel. Reduces heat loss to a minimum. Easily applied and re-applied without loss of efficiency. Saws or cuts clean with ordinary tools. Greater structural strength. Will not soften, shatter, sag, or shake down. Unaffected by moisture. Removable for pipe inspection. Less thickness required—available in single thickness up to 1200°F.

Unibestos requires only a surface application to finish it off in a neat, clean, efficient job. It is available in half-section form up to 30" pipe diameter and in quarter sections from 32" to 60", in thicknesses from $\frac{3}{4}$ " to 5" thick.

UNION ASBESTOS
MEANS PROGRESS IN INSULATION
AND RUBBER CO.

310 SOUTH MICHIGAN AVE., CHICAGO 4, ILLINOIS



Lateral drains were used to stabilize this troublesome fill on a midwestern railroad.

How this long fill was stabilized by tapping 9' ballast pockets

• When maintenance engineers tackled this mile-long trouble spot of mucky black gumbo soil, they found ballast pockets to a depth of 9 feet under the ends of each tie.

Timber piles failed to stop earth-slides; so maintenance men looked to ARMCO Perforated Pipe. Here they found the answer.

Lateral drains installed about a foot below the ballast pockets completely drained the impounded water. Speed restrictions were lifted, and this section of roadbed no longer required extra maintenance.

ARMCO Perforated Pipe can give you quick, efficient drainage wherever ballast pockets prove costly. The flexible corrugated metal design and strong joints resist crushing and disjuncting under heavy loads at high speeds.

An Armco engineer will gladly give you full information about ARMCO Perforated Pipe. Write your nearest Armco Drainage & Metal Products, Inc. office—or the general offices of the company, 2165 Curtis Street, Middletown, Ohio.

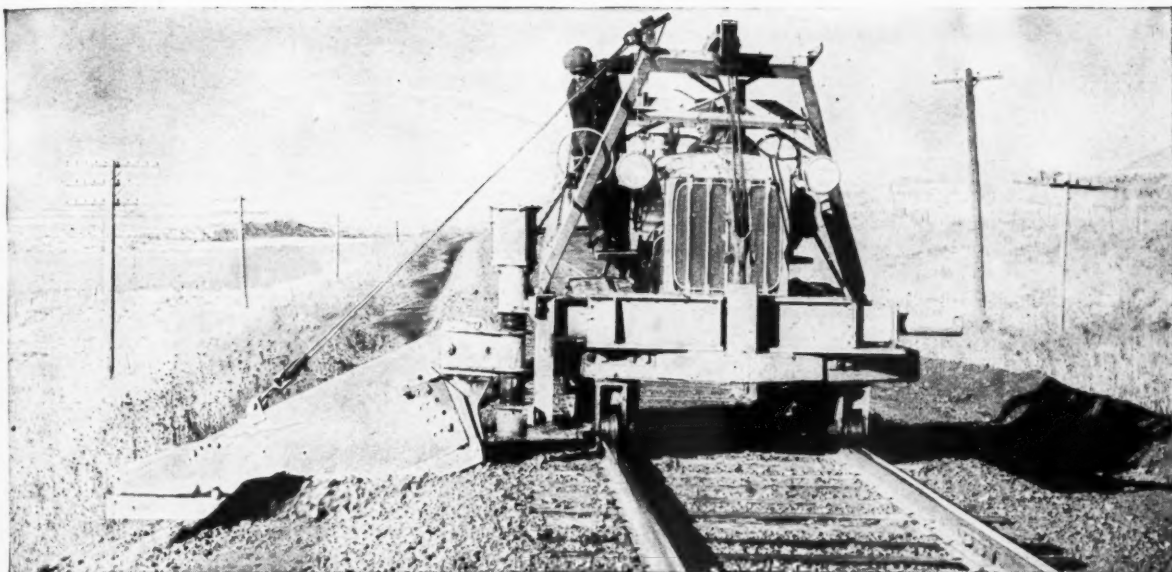
EXPORT: THE ARMCO INTERNATIONAL CORPORATION



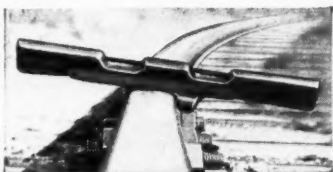
Fill drains of ARMCO Perforated Pipe continue to operate even during the winter.



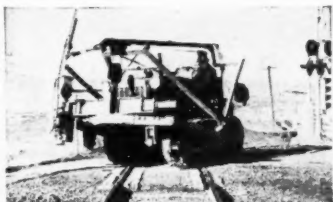
Armco Drainage & Metal Products, INC.



Esco Track Walking Shoes and Wingdozer...Put Tractors on Rails ...Speed Up Work...Cut Track Maintenance Costs!



Esco track walking shoe that puts tractor on rails, enables it to do work of a locomotive on construction and maintenance.



Tractor gets on and off tracks quickly. Operates either on or off the track.



Wingdozer blade in position for bank restoration work, builds bank evenly and to proper slope.

Esco track walking shoes have revolutionized track construction and maintenance. When equipped with these shoes and wingdozer, a crawler type tractor runs on rails like a locomotive, spreads ballast, grades, and skeletonizes without interrupting the train schedules and without loss of time.

When a train comes through, the tractor simply runs off the track and moves back on after the train has passed. On one mainline job, 20 trains passed over the track every day, but the work was finished on time.

Using the track walking tractor and wingdozer, a crew can do twice as much work as before. Costs of

construction and maintenance are cut materially.

Esco track walking shoes can be put on any crawler type tractor with tread from 50 inches to 66 inches, including:

"Caterpillar" D6 and RD7
International TD18, TD14, TD40
Allis Chalmers No. 10
Cletrac 55

DESCRIPTIVE FOLDER FREE ON REQUEST

Esco bulletin 153 illustrates and describes the track walking shoes and wingdozer. Ask your nearest Esco representative for a copy, or write direct to us.

ELECTRIC STEEL FOUNDRY

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Specialists in Applied Metallurgy

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Douglas 8346

SPOKANE, 8
121 S. Monroe St.
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LOS ANGELES, 11
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Dearborn 2284

IN CANADA—**ESCO LIMITED**, 1084 Homer St., Vancouver, B.C. Telephone Marine 2343



Now... stabilize roadbed
at low cost...



With long-lasting asphalt-cement pressure grouting

EASIEST, least costly and surest method of eliminating water pockets in subgrade of both ballasted and unballasted roadbed is asphalt-cement pressure grouting—using *Texaco #24 Emulsified Asphalt* developed especially for this work.

Texaco #24 Emulsified Asphalt makes the grout flow easier and helps hold the cement and sand in suspension during grouting. After the grout is placed, the emulsion releases the asphalt which aids in waterproofing the soil and keeping it resilient and stable without becoming hard and brittle. Leaner mixtures of cement can be used successfully, too—materially reducing costs.

The use of *Texaco #24 Emulsified Asphalt* also improves the penetrating and self-sealing properties of the

grout—enabling it to force the water completely from pockets and prevent its future accumulation under the roadbed. Track stability is quickly restored and the grouting can be done without interfering with traffic.

This method of track stabilization—developed through cooperative laboratory and field tests by The Texas Company and a western railroad—has produced truly amazing results. The examples of these results shown at the right are typical of those achieved by other railroads. No failures have been reported to date.

For full information about asphalt-cement pressure grouting, call the nearest Railway Sales Division Office listed below, or write The Texas Company, *Railway Sales Division*, 135 East 42nd Street, New York 17, N. Y.

THIS IS WHAT ONE WESTERN RAILROAD HAS DONE

Reduced Stabilization Costs: Roadbed grouting costs vary with conditions encountered, have ranged from 30¢ to 91¢ per track foot for this railroad—far less than the cost of installing drainage, impervious blankets over ballast, and other previous means of stabilization.

Eliminated Slow Orders: Prior to grouting 1½ miles of single-track passenger main line, where 100 m.p.h. speeds were permitted, slow orders had to be kept in effect as much as 262 days a year. Since grouting in 1942, no slow orders have been necessary.

Saved Man-Hours: On this same section of track, savings in man-hours come to 3412 per mile per year—enough to pay back the cost of stabilization (53¢ per track foot average) in one year.

Reduced Maintenance Costs: After grouting a mile of double-track main line, average maintenance cost dropped from \$75.30 to \$24.22 a month—a saving of nearly 68%.

NEW YORK ★ CHICAGO ★ SAN FRANCISCO ★ ST. PAUL ★ ST. LOUIS ★ ATLANTA



TEXACO Emulsified Asphalt

FOR GROUTING

TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT STARRING JAMES MELTON WITH HIS GUEST, ED WYNN—CBS



Twice the Strength
OF OLD STYLE CARBON WRENCHES
Half the Cost
OF ALLOY STEEL WRENCHES

● Williams "Superior" Wrenches are drop-forged from a selected grade of carbon steel and processed to exacting specifications. They are substantially twice as strong as the earlier carbon steel wrenches of our own manufacture. Comparative tests show that these wrenches average 93% as strong as our corresponding alloy steel wrenches costing approximately twice as much.

Most industrial users find Williams "Superior" Wrenches their logical choice considering both strength and economy. "Superior" Wrenches are made in 50 patterns . . . more than 1,000 sizes, and are sold by Industrial Distributors everywhere.

J. H. WILLIAMS & CO., BUFFALO 7, N. Y.



WILLIAMS
DROP-FORGINGS AND
DROP-FORGED TOOLS





Planning a Pier?

Begin it Right with MONOTUBES

JOB-EXPERIENCED engineers and contractors . . . with an eye on lower costs . . . are enthusiastic in their endorsement of all-steel Monotube foundation piles.

Here's why:

Monotubes have an exclusive fluted, tapered design that makes driving with average job equipment result in lower costs and no delays. A special extendible feature allows quick, simple field extensions with either tapered or uniform sections. And as for inspection—they're hollow, top-to-toe. You can be *sure* they're right before concreting. Ready for your next job in a gauge, size and taper to suit your needs. For complete information, write The Union Metal Manufacturing Company, Canton 5, Ohio.

Also for—
Buildings—Bridges
Airports and
Highways

UNION METAL

Monotube Tapered Piles

UNIT 1020

for the TOUGH jobs



**10 TON
CRANE**

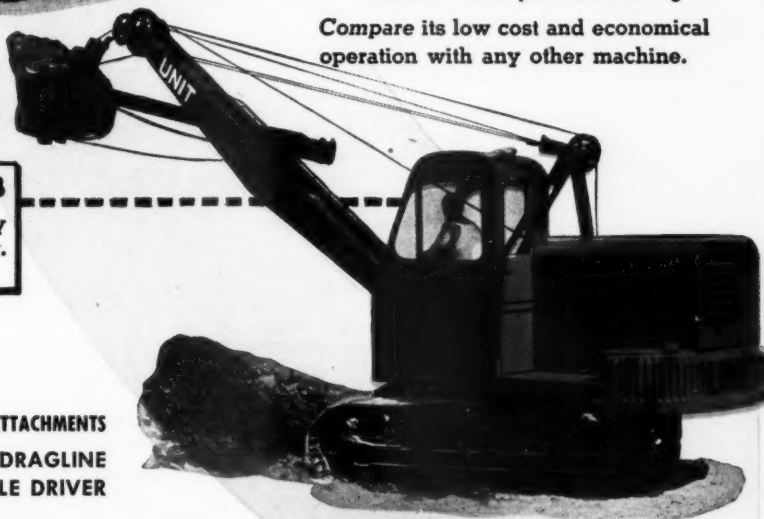
FULL VISION CAB

Complete 360 degree visibility
at all times. Promotes safety.
Increases job efficiency.

Consider these exclusive features not
found in any other comparable crane
or shovel:

- New style full vision cab.
- Gasoline engine mounted in
straight line with main machinery.
- Drop-forged alloy steel gears and
splined shafts.
- Automatic traction brakes . . . no
manual control required.
- One-piece cast gear case, simple
in design and built as carefully
as the finest automotive trans-
mission...dust proof and oil tight.

Compare its low cost and economical
operation with any other machine.



Convertible TO ALL ATTACHMENTS

- SHOVEL • CLAMSHELL • DRAGLINE
- TRENCHER • MAGNET • PILE DRIVER

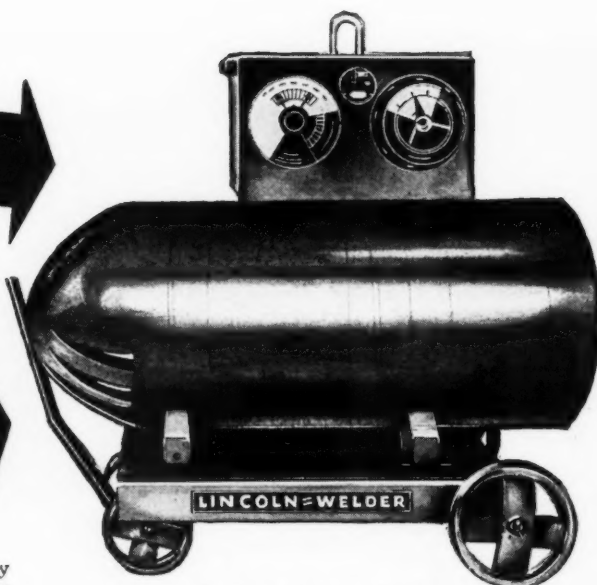
CONTACT FACTORY DIRECT
FOR PRICE AND DELIVERY

UNIT CRANE & SHOVEL CORP.



**3/4 YARD
SHOVEL**

**MILWAUKEE 14,
WISCONSIN, U.S.A.**



Here is a chance to pick up are welding equipment in any desired quantity at low cost. Large quantities of 300 to 400 ampere MG type welders—primarily of Lincoln and Hobart make—are available for sale. Largest inventories are in the Boston, Detroit, Cleveland, Chicago, Atlanta, Nashville, Houston and Philadelphia offices of War Assets Administration. They may be obtained, however, by contacting any of the War Assets Administration offices listed below. Equipment from 200 to 400 amperes in DC, gasoline-engine driven and AC sets are available in smaller quantities . . . also multiple operator types and related equipment such as electrodes, welding rods, weld positioners and flame cutters. Spot, seam and flash welders are likewise available. The equipment is for both production and construction. Write, wire or phone your War Assets Administration office today.

LINCOLN DC Type: 300 to 400 amperes

This and many other types and makes of welding machines and related equipment are available from war surpluses.

ALL ITEMS SUBJECT TO PRIOR SALE

FREE FACTS

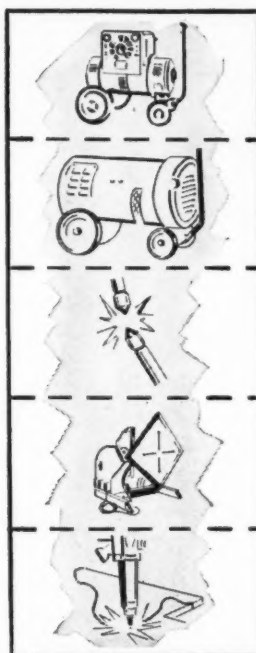
TO WAR ASSETS ADMINISTRATION:

Please send me information on availability, condition and location of the following types of equipment:

- | | |
|--|--|
| <input type="checkbox"/> HOBART ARC WELDERS | <input type="checkbox"/> RESISTANCE WELDERS
(spot) (seam) (flash) |
| <input type="checkbox"/> LINCOLN ARC WELDERS | <input type="checkbox"/> FLAME CUTTERS |
| <input type="checkbox"/> WESTINGHOUSE ARC WELDERS | <input type="checkbox"/> WELD POSITIONERS
(capacity) |
| <input type="checkbox"/> ARC WELDERS | <input type="checkbox"/> WELDING ROD OR ELECTRODES |
| <input type="checkbox"/> (other equipment) | |

Name
Firm
Address
City State

17-1



HOBART

Standard models of this make available in large quantities and most ratings.

WESTINGHOUSE

Portable models available in limited quantities.

RESISTANCE WELDERS

Spot, seam, butt and flash type welders for production operations—also portable or gun types.

WELD POSITIONERS

Many sizes and capacities, including head and tail-stock combinations.

FLAME CUTTERS

Both single and multiple torch types, portable and stationary.

VETERANS OF WORLD WAR II

To help you in purchasing surplus property, veterans' units have been established in each War Assets Administration Regional Office.

WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver
Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville
Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia
Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane
Cincinnati • Fort Worth (Telephone 3-5381)

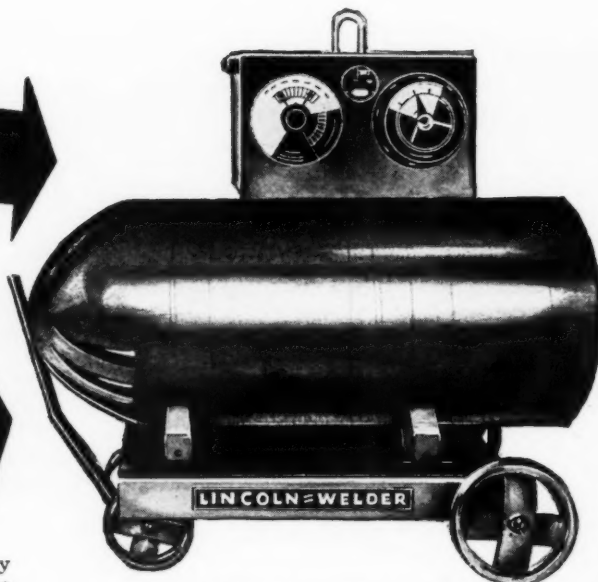
17-1



Pay dirt ... from your roadbed. With the McWilliams "Mole" Ballast Cleaner you don't have to prospect for proper roadbed maintenance. You can stake your claim on a "Mole" and be sure that you have the most economical and efficient method of cleaning cinders and dirt from your track ballast—a necessity in these days of fast schedules and heavy loads. The McWilliams "Mole" is available in intertrack and border models. Write today for complete information.

RAILWAY **M**AINTENANCE **C**ORP.
PITTSBURGH 30, PENNSYLVANIA

SURPLUS ARC WELDERS



LINCOLN DC Type: 300 to 400 amperes

This and many other types and makes of welding machines and related equipment are available from war surpluses.

Here is a chance to pick up arc welding equipment in any desired quantity at low cost. Large quantities of 300 to 400 ampere MG type welders—primarily of Lincoln and Hobart make—are available for sale. Largest inventories are in the Boston, Detroit, Cleveland, Chicago, Atlanta, Nashville, Houston and Philadelphia offices of War Assets Administration. They may be obtained, however, by contacting any of the War Assets Administration offices listed below. Equipment from 200 to 400 amperes in DC, gasoline-engine driven and AC sets are available in smaller quantities . . . also multiple operator types and related equipment such as electrodes, welding rods, weld positioners and flame cutters. Spot, seam and flash welders are likewise available. The equipment is for both production and construction. Write, wire or phone your War Assets Administration office today.

ALL ITEMS SUBJECT TO PRIOR SALE

FREE FACTS

TO WAR ASSETS ADMINISTRATION:

Please send me information on availability, condition and location of the following types of equipment:

☐ HOBART ARC WELDERS

☐ LINCOLN ARC WELDERS

☐ WESTINGHOUSE
ARC WELDERS

☐ARC WELDERS

☐
(other equipment)

☐ RESISTANCE WELDERS
(spot) (seam) (flash)

☐ FLAME CUTTERS

☐ WELD POSITIONERS
(capacity).....

☐ WELDING ROD
OR ELECTRODES

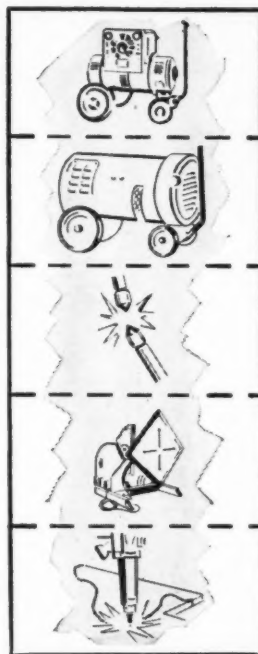
Name.....

Firm.....

Address.....

City.....State.....

170-1



HOBART

Standard models of this make available in large quantities and most ratings.

WESTINGHOUSE

Portable models available in limited quantities.

RESISTANCE WELDERS

Spot, seam, butt and flash type welders for production operations—also portable or gun types.

WELD POSITIONERS

Many sizes and capacities, including head and tail-stock combinations.

FLAME CUTTERS

Both single and multiple torch types, portable and stationary.

VETERANS OF WORLD WAR II

To help you in purchasing surplus property, veterans' units have been established in each War Assets Administration Regional Office.

WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN
RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver
Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville
Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia
Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane
Cincinnati • Fort Worth (Telephone 3-5381)

170-1



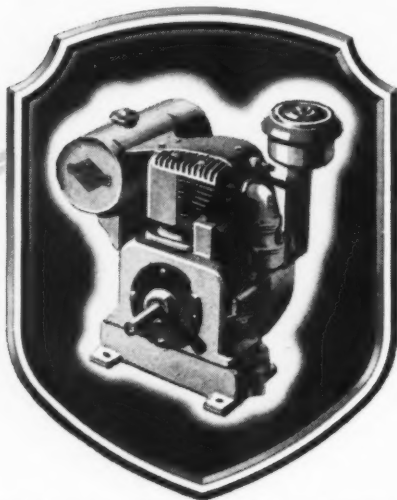
Pay dirt . . . from your roadbed. With the

McWilliams "Mole" Ballast Cleaner you don't have to prospect for proper roadbed maintenance. You can stake your claim on a "Mole" and be sure that you have the most economical and efficient method of cleaning cinders and dirt from your track ballast—a necessity in these days of fast schedules and heavy loads. The McWilliams "Mole" is available in intertrack and border models. Write today for complete information.

RAILWAY **M**AINTENANCE **C**ORP.
PITTSBURGH 30, PENNSYLVANIA

BRIGGS & STRATTON ENGINES

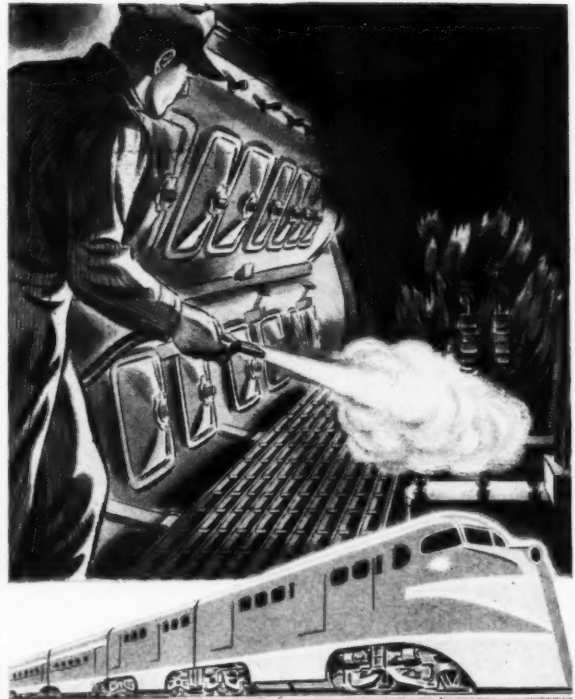
As Always - Foremost in
Value and Performance



Look with confidence to Briggs & Stratton 4-cycle, Air-Cooled engines — "preferred power" in all fields — for the latest and most advanced developments for every application requiring $\frac{1}{2}$ to 6 H. P. The Briggs & Stratton organization—with its concentration of technical knowledge, modern plants, equipment, and skilled workers—builds gasoline engines which are more than equal to today's most exacting power and performance requirements. You can expect and get more value per dollar if the appliances, farm machines or industrial equipment you buy, sell or make are powered by Briggs & Stratton.

BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U.S.A.

Air-Cooled Power



STOP FIRE FASTER

WITH



DRY CHEMICAL



Dugas 15-T
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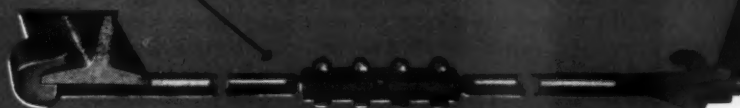
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No. 208 of a Series

Railway Engineering and Maintenance

SIMMONS-BOARDMAN PUBLISHING CORPORATION

105 WEST ADAMS ST.
CHICAGO, ILL.

Subject: What Employees Think

April 1, 1946

Dear Readers:

No other industry is so dependent on a friendly public opinion as are the railways. This is true not alone because, to survive and prosper, they must win public patronage, but also because they, like no other industry, are minutely regulated in their activities, not only by the federal government, but by government at every level and in every locality. For the same reasons, the employees of no other industry are so dependent upon a friendly public opinion as are those of the railroads, including each of you, the readers of this publication.

If the foregoing is true, it means that, to succeed in the days ahead, the railways must have the good will of the public; more than that, and equally essential, it means that the railroads must have the good will and support of all of their employees—based on informed and intelligent opinions. Long experience on the part of those dealing with railway public relation problems has convinced them that the opinions of railway employees, be they good or bad, form the keystone to the relations of the railroads with the public.

But what are the opinions of railway employees toward their industry and its problems, and especially of you men in the maintenance of way and structures departments? From our many contacts and associations with you both in the office and in the field, we might well have some fairly accurate ideas of our own on this point, but realizing that we could be in error, we have determined to get the facts. Accordingly, with our associated publications, Railway Age and Railway Mechanical Engineer, we have gone to no little trouble and no small expense to get these facts, utilizing one of the most reputable and successful public opinion sampling and analyzing agencies of the country.

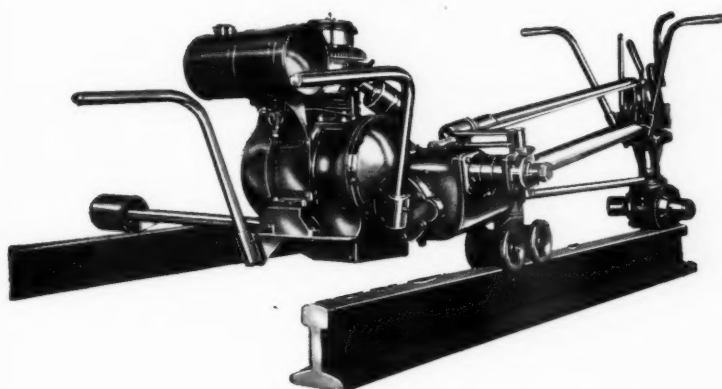
And now that we have these facts, we want to share them with you, beginning in the leading editorial pages in this issue. Indeed, to accomplish our end of being of greatest service to you and the railroads, it is imperative that you have these facts. With many of them you will be pleased because they evidence strength within your ranks and within your industry. With others you may well be dismayed, if not deeply concerned, but they are the facts, and it is our hope that you and railway managements will make the most of them, and will help to correct any situations which, in the interest of the railways, yourselves as employees, and the public, need to be corrected.

Sincerely,

Neal D. Howard
Editor

NDH:jb

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"Mr. and Mr. said **there was no machine that would back off these rusted nuts.** These nuts had been in service for over ten years and up to today had required two men on a five-foot wrench to break them loose. **The Micro Cutout was set at 40** and with much grinding and squawking of the bolt **the nut was turned off.** About every tenth nut required the use of the power lever."

"All men were greatly pleased with the machine's great power, ease and smoothness of operation."

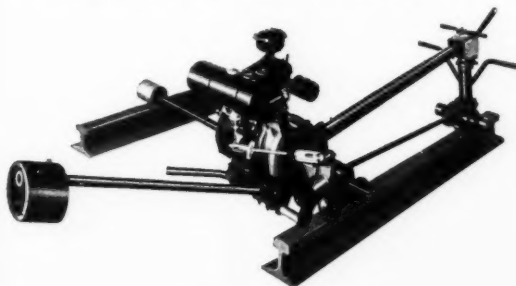
"After about 30 joints were stripped we started back on the other rail tightening out of face. I set the Micro at 25 and after testing a few joints with a five-foot wrench it was decided they should be a bit tighter.

The Micro was then adjusted to 28 after which all men agreed that the bolts were just right. Again they remarked on the machine's smoothness and ease of operation."

"Next we moved back to the first rail and ran up the new bolts in high, finishing in low. The Micro was set at 28 and the chucks turned from 1/2 turn to 2 turns in low after the Micro had released in high. **All men thought the machine very fast, no matter how it was used, and agreed it had plenty of reserve power."**

"Mr. thought the machine **just right.** He liked its power, speed, and most of all its smooth operation."

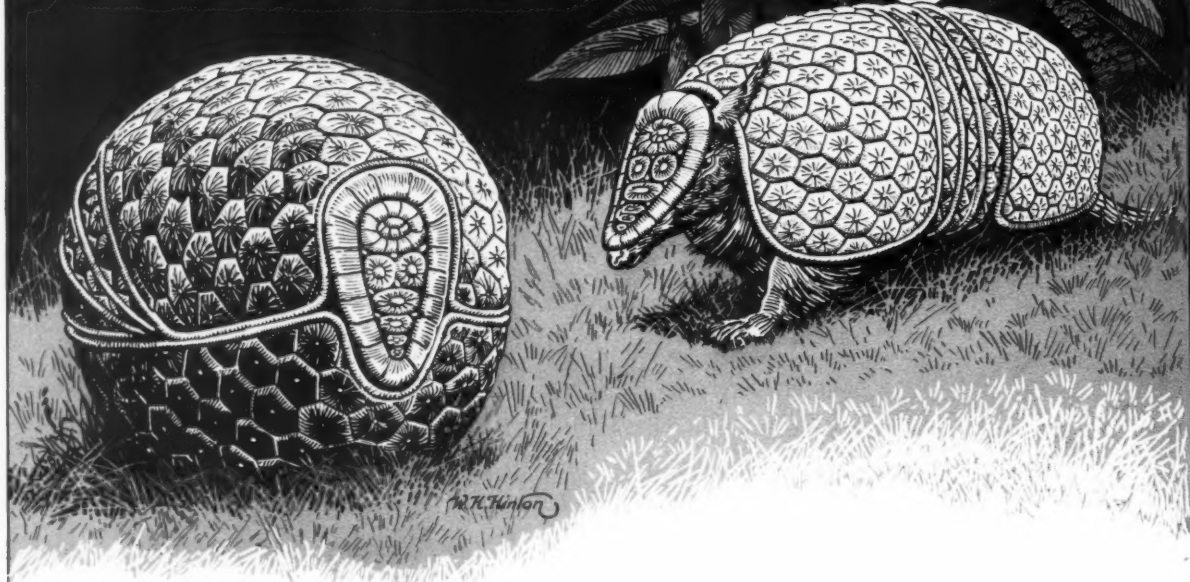
"Said he would order two Model B's and hoped he could have them by mid-summer."



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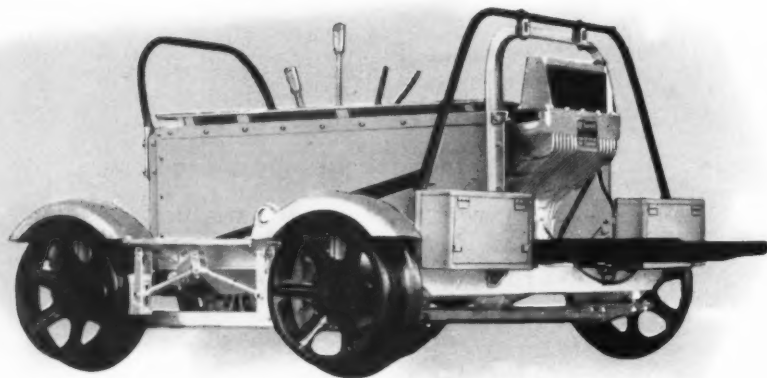
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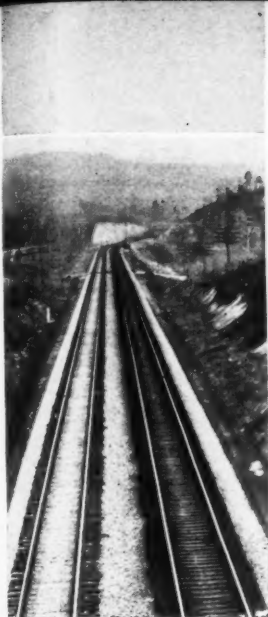
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Railway Engineering and Maintenance

NAME REGISTERED U. S. PATENT OFFICE

APRIL, 1946



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FIG. 17-C (Pat.)
RACOR AUTOMATIC SAFETY
SWITCH STAND

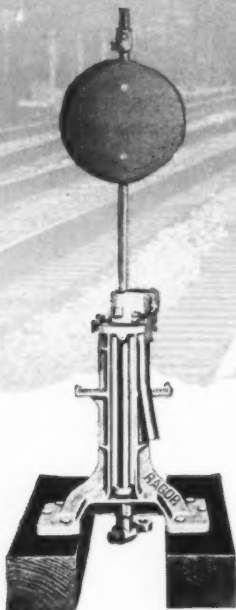


FIG. 112-D
RACOR COLUMN SWITCH
STAND



FIG. 36-H (Pat.)
RACOR PARALLEL THROW
GEARLESS SWITCH STAND

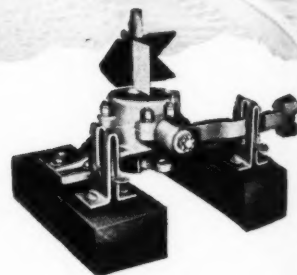


FIG. 36-D (Pat.)
RACOR PARALLEL THROW
GEARLESS SWITCH STAND

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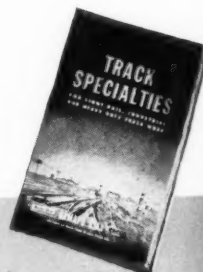
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Railway Engineering and Maintenance

What Employees Think—

Survey Shows Many Misinformed on Railway Matters

In the March issue, in an editorial titled Public Relations, three things were emphasized relative to this increasingly important subject—that the railways are faced with the huge and vital problem of selling themselves to the public as a willing servant of the country, in war or in peace, striving to render maximum service at minimum cost; that in this task there is a job for every railroad employee; and that good public relations in any industry, including the railroads, must begin at “home”. In this matter, *Railway Engineering and Maintenance*, dedicated as it is to the best interests of the railways and their employees, is keenly interested.

Essentially a departmental publication, concerned primarily with the day-to-day problems of the maintenance of way and structures forces in the adequate, efficient and economical maintenance of the fixed properties, emphasis in its pages monthly, and quite naturally so, has been placed on materials, work equipment, work organizations and methods in the solution of these problems. However, it has never lost sight of the basic fact that all of its endeavors—indeed, the endeavors of all engineering and maintenance of way and structures employees—would be of no avail, unless the railways are accepted and supported by the general public, and unless the employees of the railways, through their own correct understanding of railway problems, are in a position to influence favorably the attitude of the public toward their industry.

With its circulation confined almost entirely to officers and employees in the engineering and maintenance of way departments, and to those higher officers having general jurisdiction over engineering and maintenance matters, no attempt has been made in this publication over the years to influence directly public opinion toward the railways. On the other hand, in recognition of the important part that its readers can and must play in this vitally important matter of influencing public good will toward the railways, and a realization that that part can be played successfully only if its readers are correctly and adequately informed on railway matters themselves, it has devoted its leading editorial each month for many years to a discussion of these matters—including competition, performance, earnings, unfair regulation, subsidies to competing forms of transportation, taxes, public relations, etc.—and with ample evidence of appreciation and interest by management and employees alike.

But, in view of the importance of this matter—its vital importance to every reader, whose very livelihood and well-being rest upon continued and enhanced esteem for the railroads by the public—has this been enough, especially since the close of the war, as the railways face the most severe competition in their history, revived influences in government favorable to their competitors, and general economic conditions that will put them to the test as never before? The answer to this question must be “no”.

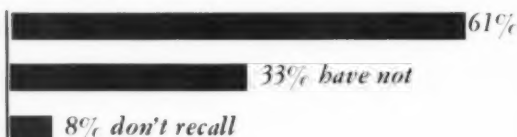
Within the limited space available in one issue each month, the answer could not be otherwise, despite the seriousness with which the attempt has been made. This we have realized for a long time, and more recently we have been upheld in this belief by a number of readers, who, sensing the importance of correct employee understanding of the basic problems of the railroads to a correct public understanding of these problems, have lamented the fact that adequate information is not filtering down to employees upon which to base a correct understanding.

(Continued on next page)

But do railway employees need to be enlightened on these matters? To what extent are they misinformed? And what, in general, is their personal attitude toward their jobs, their industry and their superior officers? With the belief that correct answers to these questions are basic to any attempt to improve employee relations and, through them, railway relations with the public, *Railway Engineering and Maintenance*, in co-operation with the *Railway Age* and its sister Simmons-Boardman publication *Railway Mechanical Engineer*, de-

"Federal Aid"

Only 61 per cent of employees have heard of "federal aid" appropriations for highways and airways.



termined to find the correct answers. Accordingly, for this purpose it engaged the services of the Opinion Research Corporation of Princeton, N.J.—a pioneer organization in the scientific measurement of public opinion by skilled sampling, based on personal questioning by skilled interviewers—to do the job.

In its survey, Opinion Research conducted personal interviews with a representative cross section of all types of railway workers, with the exception of section and extra-gang laborers, utilizing Interstate Commerce Commission statistics and data from the Bureau of the Census as guides in determining the correct proportions of the different types of railroad men to interview and the localities in which to make the interviews. Basically, the questions asked relate to the employee's appraisal of his own job and working conditions, his attitude toward management and his immediate superiors, his concern regarding competition and what should be done about it, his views on service and efficiency, and his understanding relative to the profits and income distribution of the railways.

Oviously, all of these questions and the answers thereto cannot be discussed in one editorial, without the risk of overburdening one on such highly important matters—and without crowding out of our pages other matters relative to the day-to-day practical problems of our readers, which we do not propose to do. Therefore, only the highlights of a few of the questions raised will be pointed out this time, but more must be said later since much of the information disclosed by the survey warrants discussion in considerable detail.

Employees Like Their Jobs

Basically, railway employees like their jobs. If there was ever any doubt of this fact, it has now been established as a scientific fact by the survey conducted jointly with our associated publications. That is to say, a substantial majority of all railway employees, and of maintenance of way and struc-

tures employees, like their jobs so well that, if they were starting in all over again, they would still turn to railroading. Of those questioned in this regard, 62 per cent (60 per cent m. of w. & s.) say they would enter railroading again, more than half of all respondents saying either that they "enjoy railroading" or that "it's in my blood". The minority who do not like their jobs, for the most part, give such reasons as "slow advancement, prefer other work, could make more money, or could secure more regular hours elsewhere."

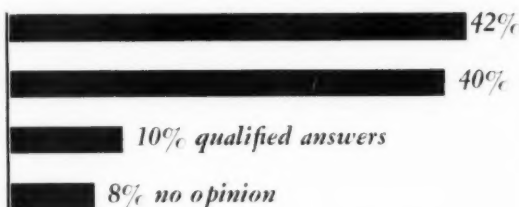
At the same time, railway employees regard higher railroad officers in a favorable light, both as personalities and as capable administrators, 30 per cent of those questioned (25 per cent m. of w. & s.) pointing out that they have met or talked with the presidents or vice-presidents of their respective roads. Furthermore, the same high rating that employees give their top officials is extended to their own supervisors, as 66 per cent of them (68 per cent m. of w. & s.) rate their immediate superiors good, with another 21 per cent (17 per cent m. of w. & s.) of the opinion that their officers are at least average.

Concerned About Future

Nine railroad workers out of every ten (89 per cent of all employees, 92 per cent m. of w. & s.) say unqualifiedly that the railroads did the best war job they could, with only a relatively few (7 per cent of all employees and 3 per cent of m. of w. & s. employees) stating that they could have done better. Furthermore, 63 per cent of those questioned (60 per cent m. of w. & s.) say that under

Danger from Competition?

42 per cent of employees believe that competition from other forms of transportation will bring hard times on the railroads, while 40 per cent don't think so.



government operation, the railroads would have done a worse job. In fact, only 9 per cent (11 per cent m. of w. & s.) say that government operation would have produced better results, the remainder feeling that the results would have been the same, or with qualified answers or no opinions.

The survey shows that many railway workers are seriously concerned about the future of the railroads in the competitive race with other forms of transportation, an attitude that carries important implications, not alone from the point of view of worker morale, but also from a public relations standpoint. In this regard, 42 per cent of these

questioned (41 per cent m. of w. & s.) fear that post-war competition will bring hard times to the railroads and their workers, while about the same percentage thinks that competition won't be that severe. However, of the 42 per cent who foresee serious difficulties in competition, only 19 per cent (9 per cent m. of w. & s.) think that the officers of their companies are failing to do as much as they should to meet this competition.

Many Misinformed

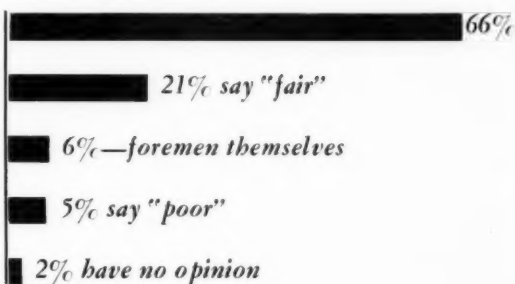
Despite this apparent concern for the future of the railroads, high proportions of railroad men are not now aware of the competitive advantages enjoyed by other forms of transportation, and many reveal apathy toward this discrimination. The survey of railroad employee opinion conducted by *Railway Engineering and Maintenance* discloses that 64 per cent of all railway employees (64 per cent m. of w. & s.) believe that, prior to the war, railroads, airlines and waterway and highway carriers all had an equal chance to make a fair profit.

This substantial majority of employees has reached this conclusion despite the fact that an even slightly larger ratio (68 per cent of all employees; 65 per cent m. of w. & s. employees) is aware that railway taxes—all going for general government expenses, and none for providing railroad facilities—are more burdensome than the taxes paid by other forms of transportation, such taxes (or, more properly, fees) being largely used for the payers' own benefit.

Only 61 per cent of all railroad employees (65 per cent m. of w. & s.) realize that there have been

Think Well of Foremen

Two-thirds of employees rate their supervisor or foreman as "good".



"federal aid" appropriations for competing forms of transportation, and one employee out of three believes that such appropriations are a "good idea". Of the 28 per cent of all employees (24 per cent m. of w. & s.) who believe that the tax-and-regulatory situation before the war did not give the railroads an even chance to earn a profit, about half would correct the condition by equalizing the conditions of taxation and self-support. The remainder would achieve equality through changes in regulations and by means of adjustments in the rate level.

Despite the evident lack of definite understand-

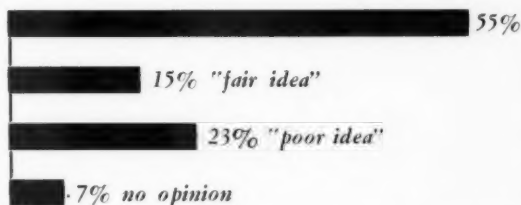
ing by employees of the principal source of the railroads' competitive difficulties, and, hence, of the means and the places where correction must be forthcoming if such difficulties are to be mitigated—a substantial percentage (42 per cent of all employees; 41 per cent m. of w. & s. employees) believes that competition is going to bring hard times to the railroads and their employees.

More Information or Education Required

If, as most persons who have informed themselves on the railways' competitive situation believe, the establishment of a greater degree of

Transport Subsidies Approved

Of railroad men who have heard of "federal aid" to other forms of transportation, 55% say it is a "good idea".



equality in taxation and self-support among all agencies is essential to any enduring and dependable prospect for railroad prosperity, then it is evident that considerable public and employee education in the basic economics of transportation will be required. In such an effort, obviously, the employees must come first, since it is quite unlikely that the public in general will be sufficiently interested to learn more about the transportation business than the people actually engaged in it as their means of livelihood.

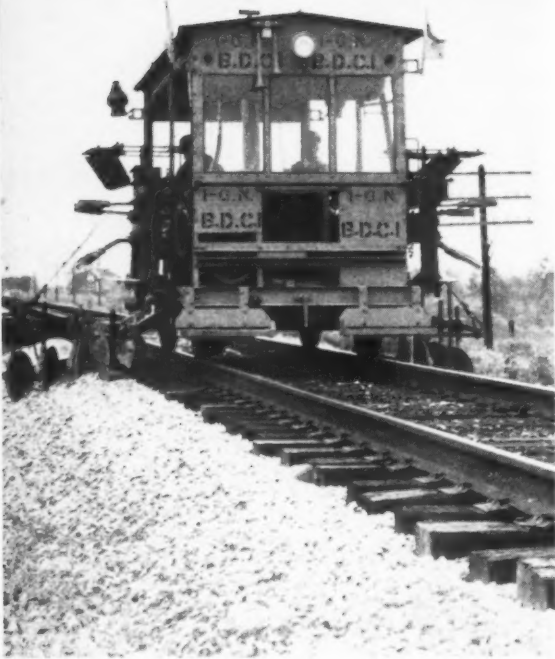
A Serious Obstacle

Furthermore, our survey indicates that the majority of employees need further information or education on the rate of profit that has been earned by the railways, on the investors' and employees' share in these profits, and on many other matters which, unquestionably, have a bearing upon their attitude toward the railroads and their jobs. In supplying this information or education, *Railway Engineering and Maintenance* hopes to play a part through further discussions of these matters in subsequent issues. In this endeavor, however, it faces one serious obstacle in that, in spite of the evidence of a considerable degree of misinformation or lack of information on the part of employees, its survey shows that it is the belief of many employees of the railroads that they are already sufficiently informed about the railroad business.

Can railway employees be convinced of their misinformation or lack of information on subjects vital to the railroads and to themselves? We feel certain that they can, and in the interest of the railroads, and the interest of employees, we hope to be of some help.

Weed Control Gets

Convinced that the growth of vegetation on the tracks and right of way must be effectively controlled in the interest of efficient train operation and economical track maintenance, the Missouri Pacific Lines in Texas and Louisiana have given careful attention to this problem over a period of years. The resulting system of weed control that has been developed, which is described in detail in this article, makes use of a variety of different types of modern equipment.



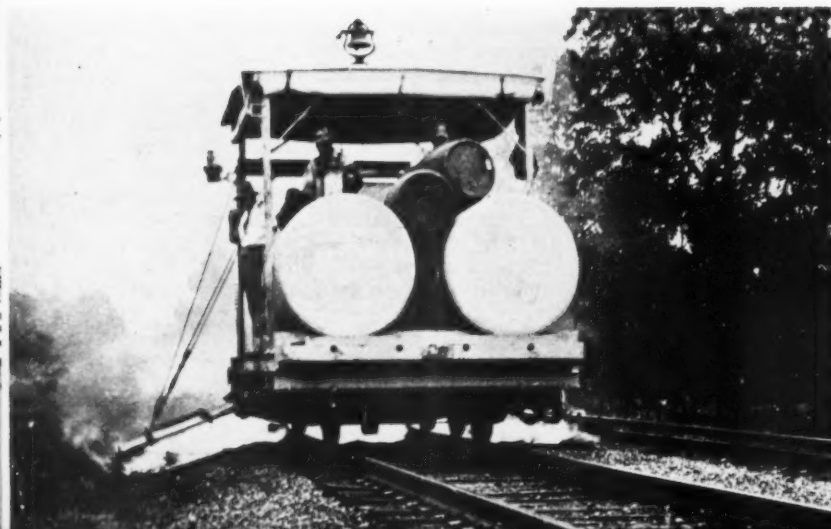
Left—One of the Combination Discers and Scarifiers Used in the Weed-Control Work. Below — "Octopus" Type Burner in Operation



SERVING as they do a territory that has a relatively warm, moist climate, with a long growing season, the Missouri Pacific Lines in Texas and Louisiana, motivated by the conviction that effective weed control is essential to efficient and economical track maintenance, as well as to avoid interference with train operation, have found it necessary to give particular attention to this problem. As a consequence, a system of dealing with vegetation growing on the tracks and right of way has been evolved, which, combining the use of various types of modern equipment, is producing results that are considered highly satisfactory. In brief, the equipment that is used in weed-control work on these lines includes weed burners of both the large on-track type and smaller units that may be operated either on or off the track, weed mowers of both the on-track and off-track types, and ballast-discing and scarifying machines, the latter being used in combination with the large on-track weed burners.

Mileage and Location

The Missouri Pacific Lines in Texas and Louisiana are comprised primarily of the Gulf Coast Lines and the International-Great Northern. The Gulf Coast Lines, consisting of approximately 1,734 miles of lines, is primarily an east-west road extending from Baton Rouge, La., on the east, to Brownsville, Tex., on the west, the latter being a point at the extreme southerly tip of the state where the Rio Grande river empties into the Gulf of Mexico. Between the two points mentioned the main line follows roughly the curve of the Gulf



Left—The Weed-Control Equipment Used Includes a Number of Oven-Type Burners

Special Attention

On These Lines

coast. At intervals it is joined by branches of varying lengths, which include, at the extreme southerly end of the road, a network of relatively short lines serving the produce-growing region in the lower Rio Grande Valley.

The International-Great Northern consists of 1,155 miles of lines located in South Central Texas, with one line extending as far north as Ft. Worth and another to Longview. The principal point of connection between the two lines is at Houston where the main line of the G.C.L. is joined by two lines of the I.-G.N. The main lines of these companies are largely single track and are ballasted mostly with either crushed stone or pit-run gravel. Some of the branch lines have sand or earth ballast.

The territory served by these roads, especially along the Gulf coast, is relatively mild, with a long growing season and ample rainfall to promote rapid growth of vegetation. In fact, on that section of the G.C.L. south and west of Raymondville, Tex., which is known as the Rio Grande Valley Line, vegetation grows vigorously the year around, requiring constant vigilance in keeping weeds and grass under control on the tracks and right of way. The most common types of plants that have to be dealt with include Johnson grass, Bermuda grass, Ball grass and various types of heavy, fast-growing, broad-leaved weeds, all of these being found at most locations on both the G.C.L. and the I.-G.N.

Weed-Control Emphasized

Effective weed control is considered on these lines to be an essential adjunct to a sound maintenance policy. It is recognized for instance that the uncontrolled growth of vegetation in track ballast not only accelerates decay of the ties but also hastens the fouling of the ballast, with resulting increases in maintenance costs. Also, where there is a rank growth of vege-

tation on the track, track tools and fastenings are lost readily and the activities of track gangs are hampered seriously. In fact, past experience has shown that whenever weed growth in the track has been neglected for any reason, even for a relatively short time, it has been necessary for the track forces to pull or otherwise remove the weeds before any constructive work could be done. Because of these considerations it has been demonstrated conclusively that effective weed control produces dividends, in the form of man-hours saved and lower maintenance costs, that are more than sufficient to justify the time and cost involved. Other considerations involved in motivating these roads to an effective program of weed control are the avoidance of wheel slippage caused by the presence of weeds on the rails, and the desire to eliminate the hazard involved when trainmen are required to make their way through tall weeds when walking along the track shoulder.

For controlling the growth of weeds on running tracks and along their shoulders reliance is placed mainly on large track-mounted weed burners which, when the ballast consists of gravel or stone, are used in conjunction with track-mounted disc-

ing machines that are operated ahead of the burners to turn up the roots of weeds and grass, thereby exposing them to the flames of the burners. When operated in this manner, the discing machines serve a two-fold purpose, helping on the one hand to enhance the effectiveness of the weed burners, while performing, on the other, the function of improving the drainage of the ballast section thereby promoting economical maintenance.

Supplementing the weed burners, and frequently used in combination with them, are a number of track-mounted double-swath weed mowers that are also used primarily on running track. For controlling weeds around yards and stations, small weed burners of the "Junior" type are used, which may be operated either on or off the track. These burners can be operated by section men, and their use at such locations precludes the necessity of delaying or diverting the larger burners for this purpose, with their regular operators and crews. For controlling weed growths out of reach of the track-mounted machines the company maintains a considerable number of power-driven off-track mowing machines.

The Machines Used

To be specific, the weed-control equipment that is owned at the present time by the G.C.L. and the I.-G.N. includes 8 Woolery five-burner "Octopus" type weed burners; 4 Fairmont six burner oven-type machines; 24 Woolery "Junior" type burners which may be mounted either on wheels for use off the track or on low push cars for use on the track; 10 Fairmont on-track double-swath weed mowers; 37 Allis-Chalmers wheel-type Model B

Another View of an "Octopus" Type Machine Burning Weeds on a Section of Main Track





Above—The Lines Have 37 of These Off-Track Power Weed Mowers. Right—For Controlling Weeds Around Stations and Yards, Small Weed Burners of the "Junior" Type Are Used

power weed mowers, each with a 5-ft. blade; 2 International wheel type weed mowers; 2 Fairmont track-mounted combination discers and scarifiers; and 10 smaller track-mounted discing machines. Fifteen of the Allis-Chalmers machines are equipped with dozer blades, thereby adapting them to a variety of light grading jobs.

Auxiliary equipment used in connection with the weed-control work includes a number of specially-designed fire-extinguisher cars for use in putting out fires behind the weed burners. Each of these units consists of a 550-gal. water tank mounted on a push car and equipped with a Fairmont 6-hp. governor-type engine operating a centrifugal pressure pump for delivering water from the tank to four hose streams. Two of the water hoses are 10 ft. long and two are about 35 ft. in length, and all of them are fitted with nozzles having thumb valves. These water cars are proving highly effective as a means of controlling fires on the right of way behind the weed burners.

To permit the supply of water in the tanks of the extinguisher cars to be replenished when necessary from borrow pits, streams and other sources along the track, each of the cars is equipped with a small gasoline-engine driven fill-up pump with a 20-ft. suction line. When operating in territories where heavy grades are encountered, the water cars are each



drawn by a heavy-duty motor car. Where the grades permit, section cars are used for this purpose. Four of the water cars have been acquired, and eight more are now on order. Hence, when these additional cars have been delivered, there will be an extinguisher car for operation with each of the on-track weed burners.

The Purchases Reviewed

The story of the growth of weed-control practices on the G.C.L. and the I.G.N. is told by the record of equipment purchases for this class of work, which is given in the following. The first weed burners acquired were two four-burner oven type Fairmont machines that were bought in 1926, these later being converted into six-burner units. In 1930 two Woolery

five-burner "Octopus" type machines were purchased, these being followed by the acquisition of two more Fairmont machines in 1931 and 1932, respectively. These latter machines were six-burner oven-type units. The next purchases were made in 1944, when two additional Woolery "Octopus" machines were acquired. More recently four more machines of this same type were acquired. Most of the Woolery "Junior" weed burners, as well as the on and off-track weed mowers and the ballast discing and scarifying machines, have been acquired during the last few years.

The number of large on-track weed burners available on these lines is now nearly sufficient to permit one of them to be assigned to each roadmaster, and in general it is expected that they will be assigned on this basis, each of them to be accompanied by the necessary

auxiliary equipment, including discing machines and a fire-extinguisher car. The "Junior" type weed burners are assigned to the different roadmasters' territories on the basis of the extent of the yards, side tracks and station grounds to be kept free of weeds. Every roadmaster has at least one of these burners and some of them have as many as three of them. Assignment of the off-track mowing machines is also made on the basis of the need for them, some roadmasters having as many as five of these machines. The ten on-track mowing machines are assigned as needed.

Because of variations in the length of the growing season as between different territories served by these two roads there are corresponding differences in the number of months each year during which weed control activi-

ties must be carried on and in the number of burnings required. On the Rio Grande Valley line, for example, the problem of weed control is a year-around proposition, and it is generally the practice to operate the weed burners over this territory an average of 12 times a year. Over the remainder of the two lines the season for burning weeds ranges from eight to ten months, with an average of about five burnings being made each year.

If weeds are to be effectively controlled it is considered important on these lines to start burning them sufficiently early in the growing season to prevent the weeds from getting out of hand, and then to follow up as frequently as necessary to insure that they will be kept under control at all times. As already indicated, when burning weeds in territory ballasted with crushed stone or gravel, it is generally the practice to scarify or disc the ballast directly ahead of the weed burners, the purpose being to increase the effectiveness of the weed burners by turning up root systems so that they will be exposed to the flames. Where the ballast is of crushed stone, the usual practice is to use one of the Fairmont combination scarifiers and discers for this purpose. In territory that is ballasted with gravel, the discing work is generally done with the smaller discing machines, using two of them with each burner. These machines are operated in a tandem ar-

rangement, the discs on the first unit being set to turn the ballast away from the ends of the ties, while those on the second machine are so positioned that they throw it back against the ties. Each of the discing machines is manned by an operator and one helper.

The work of burning the weeds follows immediately after the discing operation. It is thought that the best policy is to burn over each stretch of track twice, the first time at a speed of four to five miles an hour, and the second time, a week or so later, at a speed of six or seven miles an hour. By then, the vegetation affected by the first burning has had time to dry out so that its destruction can be completed by a second burning at a somewhat higher speed.

The crew of each of the weed burners consists of an operator and a helper. Under conditions where it is necessary to use the on-track mowing machines, it is considered desirable to operate these machines a week or ten days ahead of the weed burners so that the vegetation will have an opportunity to dry out.

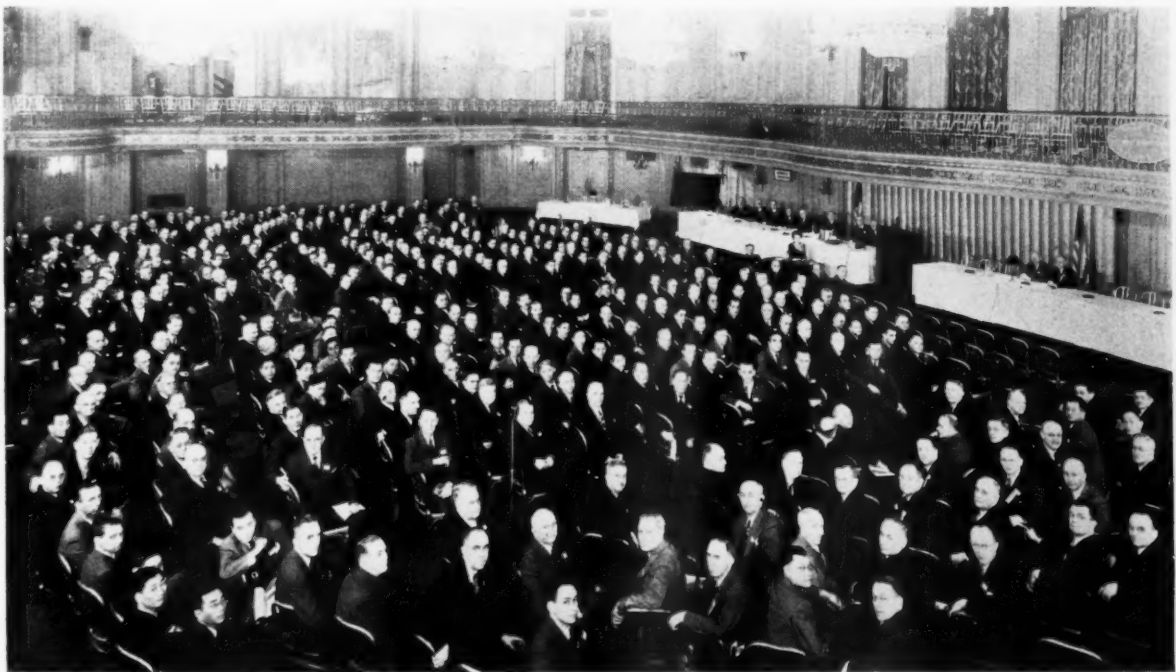
Because of the heavy and vigorous character of the vegetation encountered on these roads the searing method of burning weeds, in which the weed burner is operated at a relatively high speed, is not considered sufficiently effective to give satisfactory results.

When all of the water cars now on

order have been delivered, each of the weed burners will be followed at a distance of about 500 ft. by one of these cars for the purpose of extinguishing fires started by the weed burners. Each of the extinguisher cars is manned by a crew of four or five section men. A second crew of section men follows about two miles behind the weed burner putting out any fires that may not have been completely extinguished by the water car.

Distillate for the weed burners is furnished under contract by local dealers and is delivered in trucks from which it is pumped directly to the fuel tanks on the machines. During the working season the burners and other machines employed in weed control work, in common with other maintenance of way work equipment owned by these roads, are inspected regularly by the roadway machine maintainers and by the supervisor of work equipment, with the idea of making any repairs that may be found necessary.

Weed-control activities of the G.C. L. and the I.-G.N. are under the general supervision of C. S. Kirkpatrick, chief engineer, and F. S. Schwinn, assistant chief engineer, both with headquarters at Houston, Tex., and are supervised directly by the respective division engineers and roadmasters. J. Largent, supervisor of roadway equipment, is in direct charge of the assignment and maintenance of the various machines used.



Members and Guests of the American Railway Engineering Association in Session at the Forty-Fifth Annual Convention Which Was Held at the Palmer House, Chicago, March 12-14. With a Registration of 1337, this Was One of the Largest A.R.E.A. Meetings on Record. A Detailed Story of the Convention May Be Found in the Railway Age of March 16

Seasoning Ties in



Left—T-C vapor dried, creosoted red oak crossties after two years of service in track on the Asheville division of the Southern. Below—Air seasoned, creosoted red oak crossties, treated and installed at approximately the same time as vapor dried stock, after two years of service in track on the same division. Both photographs taken October 8, 1945.

A NEW method for seasoning cross-ties, switch ties, piles, poles, timber and lumber has been developed by the Taylor-Colquitt Company, Spartanburg, S.C., which not only allows an astonishing reduction to be made in the time required for the seasoning operation, but which can be controlled to reduce seasoning checks and splits until they become all but negligible. That this process, which is known as the Taylor-Colquitt vapor-drying process, will also prevent the occurrence of splits and checks in subsequent service, is said to have been demonstrated by periodic observations of vapor dried crossties in test track during the last two years.

Development

The new process, which is the product of more than six years' intensive research, was developed, first, in the laboratory, then in one of the most modern pilot plants for wood preservation in the country and, finally, in a full-scale, completely-equipped, commercial treating plant. It opens up the promise of revolutionizing tie production, because it makes possible a shortening of the time from the stump, through the treating plant and into the track, to a matter of days instead of months, as is required under present methods

of seasoning. It is claimed that the new process will remove as much moisture overnight from green red oak crossties as it is possible to evaporate from the same ties through 15 months of ordinary seasoning.

Four thousand gallons, more than 16 tons, of water have been removed from individual charges of 800 red oak crossties during 14 hours of vapor seasoning in Taylor-Colquitt's newly-equipped commercial plant at Spartanburg, S.C. The average moisture content of the ties was reduced

by approximately 30 per cent during the process. Because of their freedom from checks and splits, the vapor dried ties stand out in sharp contrast to 15-month air-seasoned stock of the same species from the same general production territory. Gum and other quick-decaying species may now be treated while the wood is in its prime, without the feeling of uncertainty that frequently is interjected despite the most careful measures that may be adopted to avoid infection and decay occurring



in *Hours* Instead of *Months*

in the wood during air seasoning.

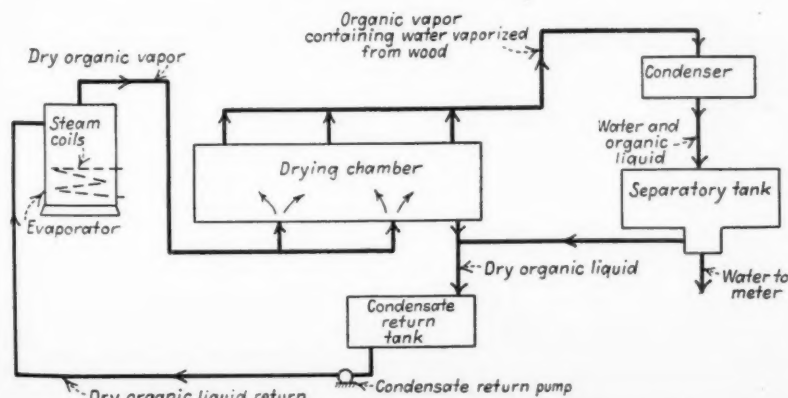
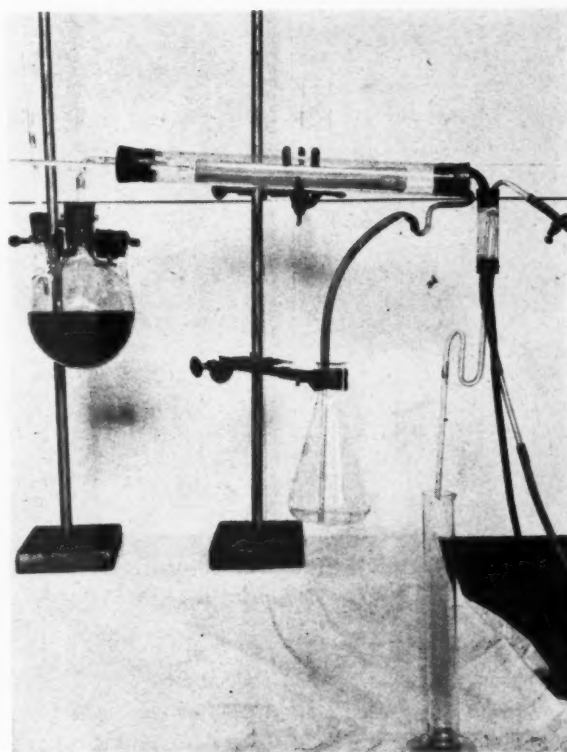
Taylor-Colquitt undertook preliminary experiments with vapor drying in its Spartanburg laboratory prior to 1940. As this work progressed it brought about the development of a small experimental unit equipped with a 16-in. by 72-in. cylindrical drying chamber that, in turn, led to the building of a full-scale pilot plant in 1942. Completely equipped, the pilot plant includes a pressure cylinder 26 ft. by 3 ft., which is used alternately as a drying and treating chamber for processing cross and switch ties, poles, piles, timber and lumber. With its electrically-heated evaporating unit, condenser, separator, complete electrical control, and measuring and weighing devices for vapor drying, as well as its complete equipment for Rueping treatment, this is one of the most elaborate experimental wood preservation plants in the country.

Basically, the application of the vapor drying process consists of exposing green or partially seasoned wood products within a closed chamber to high-temperature organic vapor which heats

the wood and rapidly vaporizes the water that it contains. The drying chamber is provided with means for removing the moisture continuously in the presence of a saturated atmosphere of an inert organic gas that is devoid of moisture and oxidizing influences. Hence, there is no opportunity for charring or hydrolysis to occur at the high temperature promoted by rapid drying, which proceeds without any detrimental effect to

Laboratory Unit

The simple laboratory drying unit shown at the right clearly illustrates basic principles involved. After the organic drying agent is heated to its boiling point in the evaporator (left), its vapor is led to a horizontal cylinder or drying chamber where it gives up its latent heat to distill water from the green wood. Any excess drying agent flows to the condensate flask (center). Vapor from the drying chamber passes to a condenser (lower right) where water is separated from the organic drying agent by gravity. Below is a flow diagram of the process showing also the various elements involved and the nature of the functions performed.

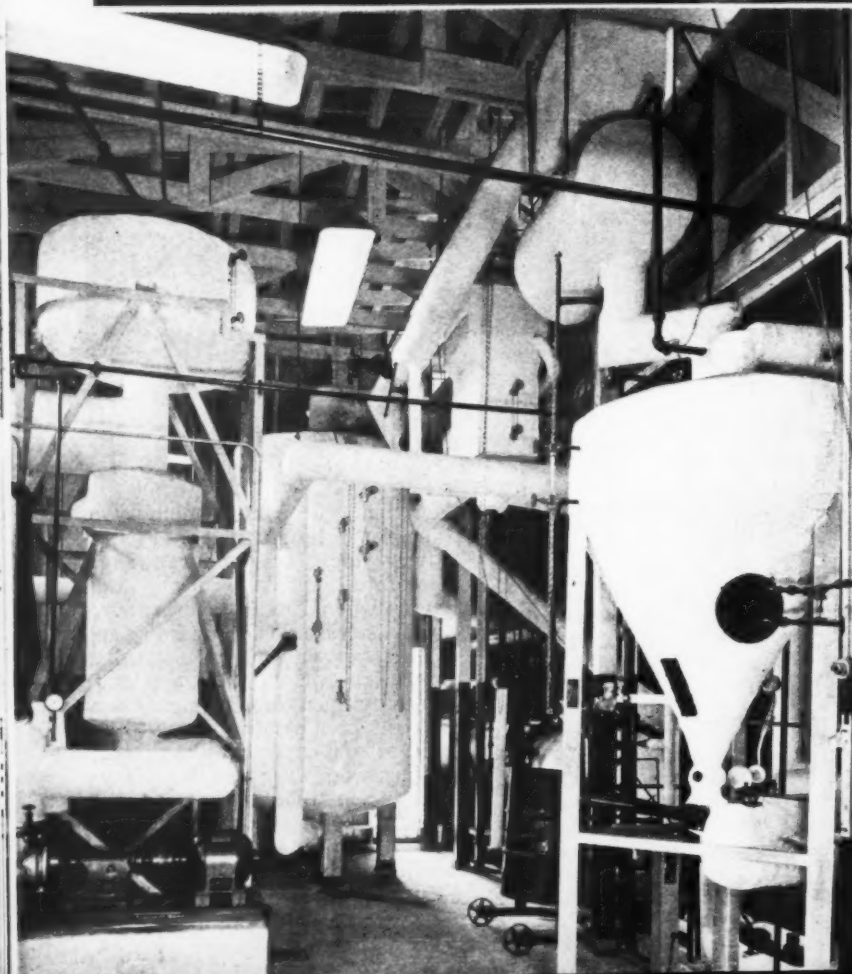
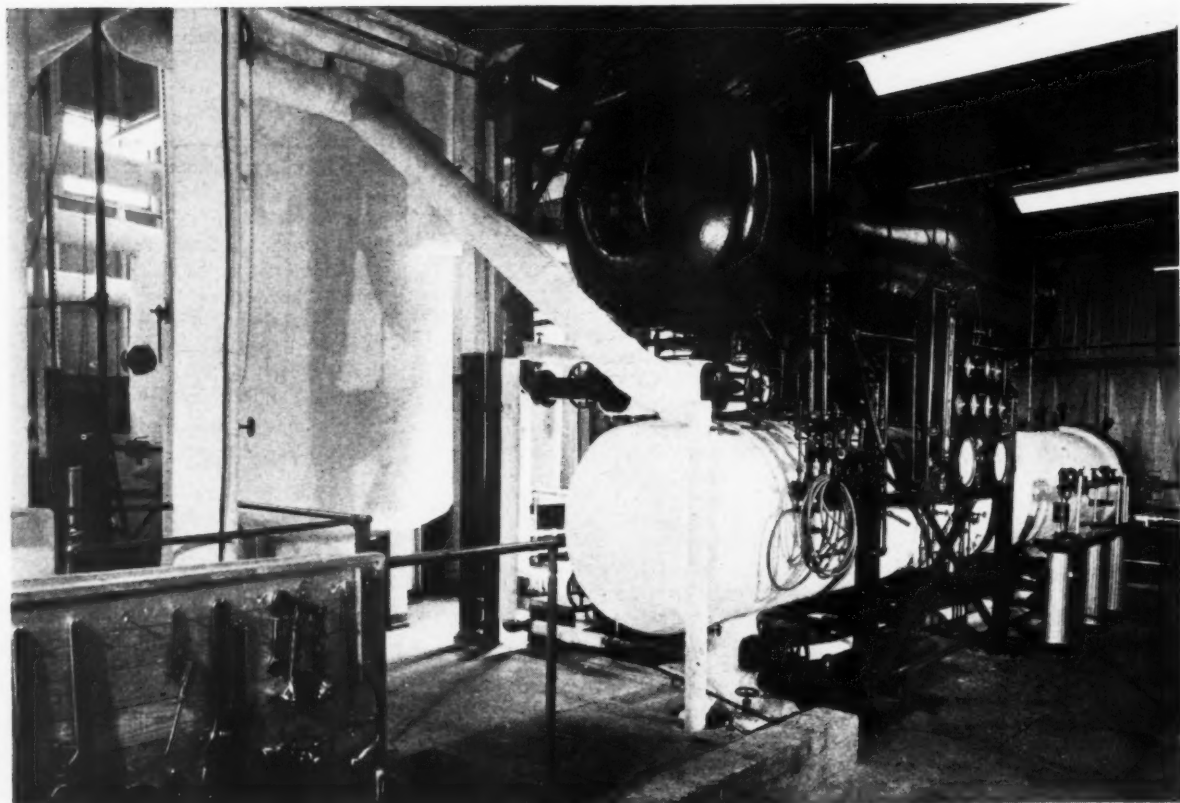


FLOW DIAGRAM OF TAYLOR-COLQUITT'S VAPOR DRYING PROCESS

This article describes a new process for the artificial seasoning of ties and other forest products preparatory to preservative treatment, that reduces the seasoning period from months to hours. Among the other advantages that are claimed to be inherent in the method, as it is being followed in the plant of the Taylor-Colquitt Company, at Spartanburg, S. C., is an equally astonishing reduction in the splitting of red oak and other woods that are prone to check during the seasoning period. With this process also, quick-decaying woods, such as the gums, can be conditioned before infection obtains a foothold; and, if desired, it can be employed as a substitute for kiln drying.

the wood. The process employs two principles of heat transfer: (1) a relatively high temperature range, heretofore limited to drying thin veneer where brief exposure precluded deterioration of the wood, and (2) the exposure of green wood to condensing vapors that accelerate drying by liberating large quantities of latent heat without injury to the wood as condensation takes place.

When wood is heated in steam or air or in a mixture thereof, to a range above the boiling point of water, but below the point of thermal decomposition of the wood (212 deg. F., to about 400 deg. F.), the chief causes



Two views of interior of Taylor-Colquitt's pilot plant. In the photograph above the large white vertical cylinder in the background at the left is the evaporator. The 3-ft. by 26-ft. drying and treating cylinder is at the lower right with the Rueping cylinder overhead. In the view at the left the evaporator is the large cylinder in the central background, the condenser is near the roof trusses in the right foreground, with the funnel-shaped separator beneath it and to the right.

of its deterioration are hydrolysis from the action of the steam and oxidation in the presence of air. The new process eliminates these factors because the drying takes place in an inert atmosphere of organic compounds that serve to transmit heat to the wood being seasoned.

The accompanying flow diagram illustrates the general relative arrangement of the equipment and the operation of the process. The drying agent is heated to its boiling point by any suitable means, such as a steam coil used in Taylor-Colquitt's commercial plant, and the vapor is introduced to the lower part of the drying chamber at several different points to assure even distribution. When first it comes in contact with the wood, the vapor condenses upon the cold surfaces and gives up its latent heat of vaporization to distill the water in the wood. Any excess

organic liquid that is not absorbed by the wood flows to the condensate-return tank, from which it is pumped back to the vaporizer to begin the cycle again.

As heating continues, the temperature in the heating chamber rises rapidly until it approximates that of the vapor in the evaporator. As the surface temperature of the wood increases, the line of organic vapor condensation retreats beneath the wood's surface and the flow of organic condensate from the cylinder decreases. When the temperature of the drying chamber and the wood approaches the boiling point of the organic liquid, an excess of the organic vapor collects within the drying chamber and is forced by incoming vapor from the evaporator into the discharge manifold and thence into the condenser. This vapor carries with it the water that has been distilled from the wood, and the mixed condensate is led into a separatory tank where gravity induces separation of the two liquids. The organic liquid is conducted to a condensate return tank, from which, after joining the condensate from the cylinder, it is pumped back to the evaporator to be revaporized.

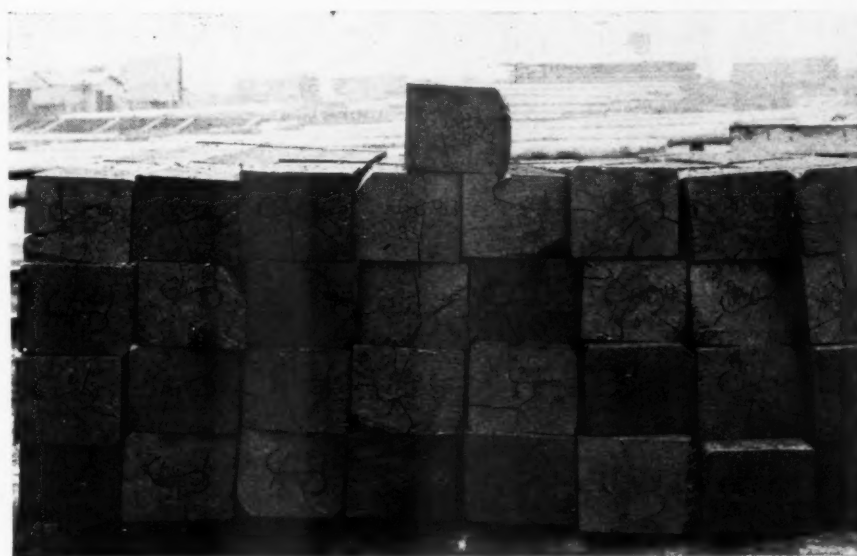
The separated water is passed through a meter, which is read periodically to determine the progress of drying, and the process is continued until the moisture content of the wood has been reduced to the desired minimum. Because at the end of the drying period the wood contains a large quantity of the liquid drying agent which has condensed during the process, and because both are at a temperature high enough to permit vaporization of the organic liquid upon application of a vacuum, the inflow of vapor is stopped by closing a valve and a vacuum is drawn on the drying chamber and its contents. The organic liquid thus removed is recovered and the dry wood, now virtually free from the drying medium, is ready for preservative treatment or for removal from the drying chamber.

Choice of Drying Agents

The circulation of the organic vapor through the drying chamber usually is conducted at atmospheric pressure and the desired operating temperature is obtained by selecting an organic compound whose boiling point at atmospheric pressure is equivalent to the temperature desired. For example, to maintain a temperature of 280 deg. F. at atmospheric pressure in the drying chamber, the chemical compound xylene, whose boiling point at at-



Above—a charge of T-C vapor dried, creosoted red oak cross-ties as they came from the pilot plant in 1943 before installation in test track on the Asheville division of the Southern. Below—A charge of air seasoned, creosoted red oak cross-ties treated in the pilot plant in 1943, prior to their installation in Asheville division test track. The checking is typical of red oak cross-ties air seasoned in the Spartanburg area.



mospheric pressure is 280 deg. F., might be used; if a temperature of 300 deg. F. were required, a coal-tar distillate known as high 1-1 flash naphtha would be satisfactory. If a temperature of 240 deg. F. is required and xylene is the only available drying agent, the conditioning may be accomplished by conducting the vaporization and circulation of xylene through the system under a vacuum of about 14 in. of mercury, which is the pressure at which xylene boils at 240 deg. F. Thus, a single organic compound permits a wide range of temperatures through adjustment of the pressure conditions in the vapor drying chamber. This flexibility, coupled with the fact that a large number of commercially available organic liquids with widely-varying boiling points are satisfactory for use in the vapor drying process, extends the available temperature range considerably.

Since the application of the vapor drying process involves exposing the wood to an atmosphere that does not attack it, an atmosphere which will not cause deterioration by oxidation because no oxygen is present; and, because that atmosphere is virtually free from steam that might cause deterioration by hydrolysis, the drying process can be carried on in the relatively high range between 212 and 400 deg. F., without injuring the wood. The only steam present in the drying atmosphere is that produced by distilling water from the wood, and hydrolysis is prevented because the steam is kept at a low concentration by the large volume of incoming dry organic vapor.

Reduces Checking

Results of vapor drying unseasoned red oak cross-ties have been essentially the same in both pilot and

commercial plants. The reduction in the number, size and extent of seasoning checks in vapor dried ties has been outstanding, compared with air-seasoned stock. This difference is apparent as soon as the ties are removed from the treating cylinder at the conclusion of preservative treatment. Furthermore, two years' service in test track in the main line of the Asheville division of the Southern have shown that the same differential has been maintained; in fact, the contrast between compara-

less than 14 hr. During that period of a year and a quarter, air seasoning reduces the average moisture content from 70 per cent to about 40 per cent, but the process also is accompanied by considerable checking and splitting, which is an inherent characteristic of air-seasoned red oak ties.

On the other hand, vapor dried ties emerge from the treating cylinders of both pilot and commercial plants with fewer checks than air-seasoned ties whose moisture content has been reduced to the same relative extent. Cross sections cut from vapor dried ties reveal small slits beginning $\frac{1}{4}$ in. or $\frac{1}{2}$ in. from the surfaces, extending inward along many of the medullary rays and ranging from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. in length, and varying in proportion to the length of the drying period. Rarely are these slits wider than $\frac{1}{16}$ in., nor have they been found within 2 in. of the ends of the ties.

Because of the presence of these ray-like slits, strength tests were conducted on vapor dried ties at the Southern Railway's laboratory at Alexandria, Va., and also at Clemson College, Clemson, S.C. Results revealed that vapor drying of unseasoned red oak ties at temperatures ranging from 320 to 330 deg. F., and employing a non-polar coal tar fraction with a boiling point within that range at atmospheric pressure, to reduce the average moisture content from 70 per cent to 30 per cent, was accompanied by reductions in strength of approximately 15 per cent, compared with unseasoned control ties. Similar conditioning reduced the strength of red and black gum ties by amounts ranging from two to eight per cent and reduced the strength of beech ties by approximately eight per cent.

To overcome strength reduction resulting from vapor seasoning, a modification of the procedure was developed by exposing ties to alternating periods of heating vapors and vacuum instead of maintaining a prolonged heating period followed by the drawing of a final vacuum. The use of the alternating cycle treatment maintains a more uniform moisture gradient and eliminates the formation of small slits that characterize straight cycle conditioning. Strength tests have proved that ties dried by the alternating cycle are as strong as their unseasoned controls (i.e., green ties of the same species, from the same territory and cut at the same time). Alternating cycle vapor dried ties were not only free from internal slits as they were removed from the cylinder but were also as free from external or surface checks as similar ties treated by the

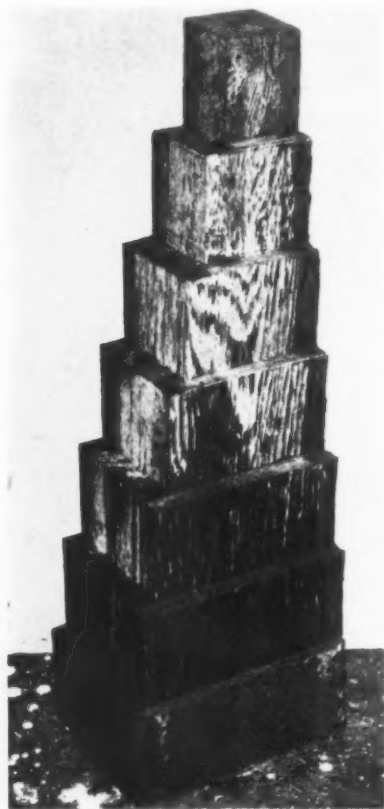
straight cycle. Strange as it may seem, however, two years of service in test track revealed a striking difference, for while they had not checked as extensively as air-seasoned ties, they had developed more checks and splits than ties that had been conditioned by the straight cycle process.

The fact that straight-cycle vapor dried creosoted red oak and hardwood cross ties developed virtually no checks, even after two years of track service, is attributed to the development of small internal slits or checks during straight-cycle drying. These many small slits serve to equalize the stresses that otherwise develop in normal ties from swelling and shrinking of the wood during air seasoning, which involves alternate periods of wetting and drying. Because the small slits developed in straight cycle vapor drying relieve the ties of stresses, they prevent the progressive development of large localized checks and splits that usually appear in ordinary ties during service. Two-year service tests indicate that ties that have been stress-relieved by straight cycle internal checking, despite an initial 15 per cent reduction in strength, will give better service than relatively stronger ties that have been vapor dried by alternating the heating and vacuum cycles, but which have not been "stress relieved."

Speeds Lumber Drying

The potentialities of the T-C vapor drying process are not necessarily confined to drying timber preparatory to preservative treatment, for the process also may be used advantageously for drying lumber. Compared to kiln-drying, the T-C process is much faster and presents an added advantage of removing resins that otherwise are very detrimental to paint coatings. The hot organic liquids that are used in vapor drying acts as solvents in removing resinous and other extractives that prevent good bonding of paint coats, and which, if not removed or treated, usually "bleed" through the paint and discolor its surface.

Lumber may be dried and impregnated with preservatives simultaneously by employing certain preservatives as organic drying agents, or by using other preservatives in conjunction with other drying agents. In wood preservative treatment the proper retention of preservative may be controlled by varying the intensity or the duration of the vacuum period that normally is used to recover the drying agent from the wood at the end of the drying cycle.



A section of a 7-in. by 9-in. by 8-ft. 6-in. red oak crosstie, vapor dried by the straight cycle and treated with 60/40 creosote-coal-tar solution to 8-lb. retention, step-cut to show penetration of the preservative.

tive groups that were treated and subsequently inserted in track at the same time was even more marked after two years' service.

Actual records show that unseasoned red oak crossties can be conditioned for preservative treatment in 14 hours or less by vapor seasoning, compared with 15 months average minimum time for air seasoning on Taylor-Colquitt's Spartanburg yard. Further experimental tests now nearing completion indicate that it will be possible to accomplish the drying even in a period substantially

Now What—In Work Equipment?

By C. E. MORGAN

Superintendent of Work Equipment and Welding
Chicago, Milwaukee, St. Paul & Pacific, Chicago

This article summarizes the comments of Mr. Morgan in an address before a recent meeting of the Maintenance of Way Club of Chicago. In it he sees work equipment as paramount to the maintenance of way forces in meeting the demands that will be made on them in the days ahead; calls for the best equipment that is available; and insists that it be selected with the greatest care and be maintained properly. He also lays on maintenance men the responsibility of keeping managements apprised of their needs for equipment, and of keeping them sold on the economies and other advantages to be derived through its use.



MANY problems confront maintenance of way men in the days that lie ahead. What are we going to do about them? Will we be able to overcome them effectively and with the necessary economy, insuring the kind of fixed properties that will enable our operating departments to go out and sell a kind of service that will defy competition?

What we are going to be able to do about these problems depends to a large extent upon our attitude toward work equipment. Are we prepared to fight for the equipment that we know will be essential? Are we prepared to get rid of equipment that is outmoded, obsolete and uneconomical, in favor of newer, more efficient units? Are we prepared to assign and use our equipment in the most efficient manner? And are we organized to maintain our equipment and to keep it in good repair, with a minimum interference with field operations? The answers to these questions must be "yes", if we are to meet the problems ahead with

the efficiency and economy that will be necessary in view of the situation with respect to competition and service that will likely prevail.

One of our first jobs as men in charge of large programs of essential maintenance work is to convince our managements of the necessity for work equipment. Through appropriate channels in our department, we must let our managements know what we already have in work equipment, what this equipment lacks in adaptability for the job that is ahead of us, and what we need in additional equipment to do the job effectively and efficiently. In this we have a sales job to do, because without the necessary equipment, we cannot hope to accomplish what is expected of us, either effectively or efficiently.

We all know of the days when our work equipment consisted of but a few machines, such as locomotive cranes, bridge derricks and ditchers and spreaders—when much of our track work was necessarily done with shovel and pick, and a lot of manpower. These days are gone forever. Times and conditions have changed.



"We Must Let Our Managements Know What We Already Have in Work Equipment, What This Equipment Lacks in Adaptability for the Job That Is Ahead of Us, and What We Need in Additional Equipment"

We could never hope to keep up with present-day requirements with such equipment and methods. Neither can we, with 1918 models of equipment, hope for 1946 results in quality and efficiency. Today, we must have adequate, well-designed equipment to carry out our work, and the finest equipment that we can acquire is none too good, in the interest of maximum production and lowest costs in carrying out maintenance work.

This is not a day of generalities in maintenance of way work. Rather, it is a day of specific requirements—requirements that demand the right kind of equipment if they are to be met satisfactorily. This means the need for many more types of equipment than have been available heretofore, but it is no excuse for amassing a wide variety of machines of different models to do the same classes of work. Insofar as possible, we should standardize our purchases of work equip-

ment. In this there are many advantages, not the least of which is that it will permit us to purchase the highest quality of equipment for the work to be done, even if each unit costs more than a less suitable unit.

Take for example motor cars, a type of equipment that reaches large numbers on the larger roads of the country. There was a time when we had seven different types of section cars and four kinds of inspection cars which, together, had seven different kinds of engines. Now we find that we can meet our requirements adequately with only four kinds of section cars and four kinds of inspection cars, involving a total of only four different types of engines. This means much more than just a fewer number of repair items on the shelf. It means less training in the proper use and maintenance of this equipment; it makes the problems less complicated for our foremen, and insures better performance all along the line. I am convinced that the more simple our equipment and the more standardized our methods, the better and more economical our work will be.

From the standpoint of more efficient use in the field, much of the benefits of standardization can be effected by keeping the same type of units together in individual gangs and in specific territories. If two types of machines designed to do the same class of work are on a road, there are marked advantages in keeping these types segregated in different gangs. This enables each gang to become trained in the most effective operation of a particular type of equipment, which is certain to increase production, minimize routine maintenance problems, and reduce the number of repair parts that it will be necessary to keep on hand.

Care in Selection

The selection of the right machine for any particular job offers a wide field for study. We can all remember when laying rail meant not much more than shipping the rail to the job and expecting someone to get it into the track by whatever means were at hand. Today, rail laying is a highly specialized operation, with a wide variety of machines, each designed to do a particular job in the most efficient manner, and closely related to the work of all of the other machines in use. This is as it should be if the most effective results are to be accomplished, and the same general principles of organization and use of equipment should be kept foremost in mind in carrying out all maintenance of way operations.

In every case, someone must analyze the job to be done and how fast it must be done. Then he must determine how it is to be done, and the investment in equipment that will be necessary to produce the results desired. Obviously, there is no economy in having on any job equipment that is not essential, or equipment overloaded with attachments that are not required for the work at hand. For example, we all know that the crawler tractor can carry such attachments as front-end loaders, bulldozers, carry-all scrapers, air compressors, arc weld-

few properly-designed machines today that will not produce better results, increase production and lower costs over hand methods, but we can all remember some of our earlier estimates of savings with work equipment which fell down completely because the equipment did not live up to expectations, or because we did not use it with sufficient effectiveness or intensiveness.

One of our problems in this regard is to keep our equipment busy over a sufficient period of the year to justify it economically. We must be constant-



Equipment That Is Obsolete Should Be Replaced With More Efficient Units

ers, crane booms, etc., and yet, wouldn't it be amazing—and wasteful—to see all of these accessories tied to a single tractor at the same time on a job that called for the use of only one or two of them. True, there isn't one of these accessories that wouldn't be of material help to someone in carrying out specific types of work, and yet there is a limit to how many of these attachments are desirable on a tractor at any one time.

Keep Equipment Busy

Then, too, we must be careful in our estimates of the economy possible with any particular equipment. In the light of present labor shortages, lower efficiency on the part of many of our men, and higher wage rates, there are

ly on the alert to find constructive jobs for these machines, in order to make them pay off to the maximum extent. In this there are large opportunities, which are increasing in number as labor continues scarce and wage rates increase.

Furthermore, the development of new machines to do types of maintenance work that are still done manually, offers us a real challenge. It may be that some maintenance operations will never lend themselves to mechanization. Some of the problems presented will be more difficult to solve than others. But we all know that we are doing many types of maintenance work today with machines that we thought were impossible of mechanization as little as 10 years ago.

The research that has been carried

on during the recent war cannot but help to bring improvements and developments in work equipment. Many are already in evidence—more will come to light. And I am convinced that this research work will go on, and that we can expect to reap the benefits in the future.

The fact that we do not have an immediate solution to many of our present problems is not discouraging to me. And one of the reasons for this is my faith in the young men of the future, gained in large part through my association with the public schools in

of work equipment as essential to its most economical performance, and express the opinion that the repair of this equipment should be under the supervision of the maintenance of way department.* I am certain that there is ever-growing agreement among maintenance of way men of this opinion. We in the maintenance department have a stake in the performance of our equipment that leads us instinctively to a greater interest in the condition of this equipment than can be expected from the men in some other department. I question very

sent in for repairs is returned to the field in the best possible working condition. Furthermore, the maintenance forces, in control of repairs, are in a better position to schedule these repairs in accordance with needs—that is, with the least possible interference with field operation. This, for example, may call for spreading the work out over most of the year, repairing during the working season only those units of equipment that can be best spared, and for which relief units can be provided, such as section motor cars; and concentrating in the winter months the repair of the heavier or specialized equipment normally used by large extra gangs on program work during the working season.

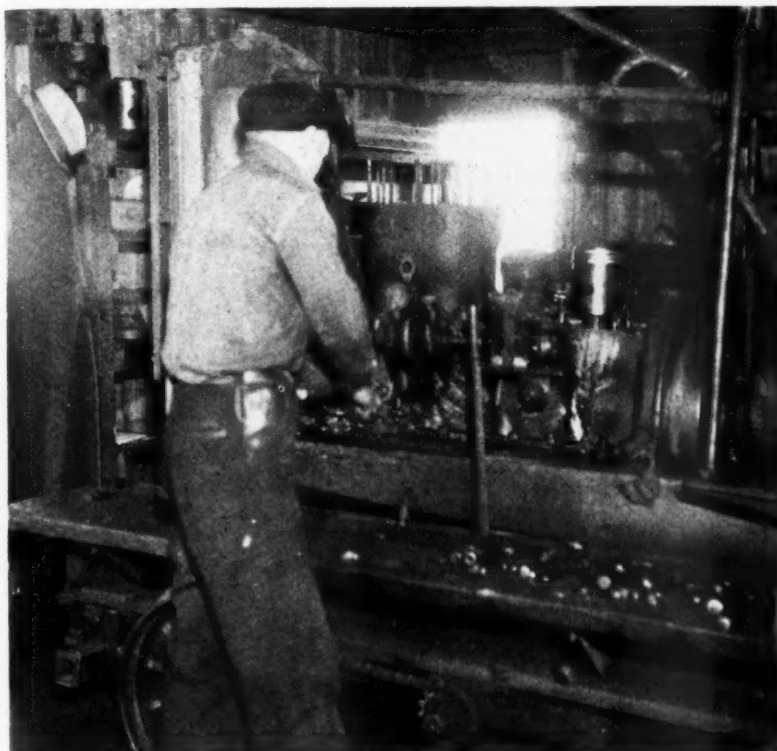
Keep Open-Minded

In closing, I want to emphasize again the importance of studying our needs for work equipment in the light of the work that is ahead of us and the economy that will be demanded in carrying out that work. We must be open-minded when it comes to ridding ourselves of old equipment which is either worn out, or obsolete from the standpoint of efficiency.

Having sized up our needs carefully, and fortified ourselves with irrefutable facts as to our requirements and the economies possible, it is our duty to bring this data before our managements, looking to authorizations of the expenditures necessary. In this, we all have a job of salesmanship to do. Every purchase made by the maintenance of way department for work equipment must be justified in the light of the return which it will bring in performance and economy, and, furthermore, in competition for the money that a road can afford to spend, every purchase recommended by the maintenance of way department for equipment must stand up against the needs of other departments for means to carry out their responsibilities.

Can Demands Be Met?

The days ahead will demand much of the maintenance of way forces. Increased speeds and a higher quality of service will require many changes in railroading as we now know it. Can we meet these new demands? With the already large numbers of capable officers and men in the maintenance of way departments of the railways, which are being supplemented daily by large numbers of equally capable men returning from service, I am convinced that we can, if we are given the proper tools and equipment with which to do it.



Proper Care of Machines Constitutes an Important Phase of the Work Equipment Problem

my home community. Too often I see boys, difficult to handle in the grades, turn out to be unusual successes in later life. There is talent there—the problem is to direct that talent to produce the results desired. And so it is on the railroads; our problem, as in the classroom, is how to train our men to do the work at hand—to bring out the talent that is within them.

Equipment Repairs

Another important angle to the work equipment problem on the railways is that of the proper maintenance and repair of this equipment. I was more than pleased recently to hear Mr. C. H. Mottier, vice president and chief engineer of the Illinois Central, stress the importance of adequate care

much whether the mechanical department, for example, would entrust its locomotives to the maintenance of way department to be repaired and kept in proper condition.

Can Do Better Job

I am convinced that the maintenance of way forces, properly equipped to do so, can take better care of its own equipment than can any other department, both because they have a better understanding of the function of each type of equipment and the service it is required to perform, and because they have a vital interest in seeing that all equipment

*Mr. Mottier's comments referred to were presented in an address reported in the January, 1945, issue, page 60.



There Are Many Considerations Involved in Planning the Renewal of Ballasted-Deck Trestles

How to Renew a

Ballasted-Deck Trestle

Abstract of an A.R.E.A. report,* which discusses the general considerations involved and the recommended procedure for the renewal of ballasted decks on timber pile bridges when a raise in grade of six inches or more is desired. This procedure is based on maintenance of the highest rate of speed of trains during construction and to permit the economical use of cranes and other mechanized equipment.

BALLASTED-deck pile trestles vary in detail on individual railroads, depending upon the requirements as to loading, the use of long chords for continuity, and whether or not stringers are lapped over caps, or butt joined. At many locations, a

slight revision of grade line is desirable, and may have been deferred until renewal of the deck is undertaken. At this time, it is usually desirable to make a raise in grade of not less than six inches to provide for ballast raises adjacent to the bridge. It also happens that many existing ballasted-deck bridges have more than the design depth of ballast because the track forces have raised the track across the bridge in connection with one or more ballast programs.

The new structure should conform with the railroad's current standard plan, including the shaping of the embankment to the proper slope, and the proper height of back wall. Most railroads use preframed timbers for creosoted pile trestles, and this re-

quires that pile and bent locations be accurately determined. First, an exact plan and elevation must be made of the existing bridge, and the proposed structure must then be so located that a minimum number of existing piles and bents will be interfered with. It may be necessary to drive one or more temporary bents to support the old trestle to insure correct bent spacing, or to avoid short and long panels. When panels of lengths different than the standard plan are used, the preframed timber must be cut, and its life is shortened. The new grade line must be established, and any required realignment predetermined. To insure proper penetration, test piles should be driven every fifth bent. These should be "outside" piles, and be so located

*Presented before the annual meeting of the American Railway Engineering Association in Chicago on March 14, by a subcommittee of the Committee on Wood Bridges and Trestles, of which H. T. Livingston, engineer of bridges, Chicago, Rock Island & Pacific, was chairman.

that they can serve in the completed structure.

With a raise in grade of more than six inches, the procedure of reconstruction requires that the track be brought to the new grade before any piles are driven. When stringers in an existing ballasted-deck pile trestle are packed as separate chords under each rail, the work of reconstruction is less complicated than where the stringers are lapped over the caps. To maintain the highest rate of speed of trains during construction, and to permit the economical use of cranes and mechanized equipment, the plan of procedure should be as follows: Remove inner guard rails and outside ballast retainers. Replace track ties with sawed ties of uniform thickness. Such ties may be either secondhand bridge ties, or track ties that are to be left in the track upon completion. Start at one end of the bridge, removing ballast and floor plank, and placing blocking between ties and stringers to insure that the load on each rail is carried by a sufficient number of stringers. This work must be done between the passage of trains, and must not stop between bents.

When existing stringers are lapped, that is, not chorded with butt joints, as in an open-deck trestle, they must be replaced with a packed chord, preassembled adjacent to the

bridge and ready for installation. Such assemblies should be made for as many panels as it is possible to place in service between the passage of trains. To install these, one-half of the track is jacked up and the existing stringers on one side are removed, shims of proper thickness are placed on the caps, the pre-assembled chord is placed and anchored to the caps, and the track is lowered to a bearing on the newly-placed temporary chord. This operation is repeated on the other side of the panels that are being changed and the work is continued until the entire existing structure has been crossed and has become an open-deck pile trestle, with its original base of rail elevation. The new temporary chords must be securely anchored to the caps, and the deck must be drift-pinned to the chords to insure maintenance of line.

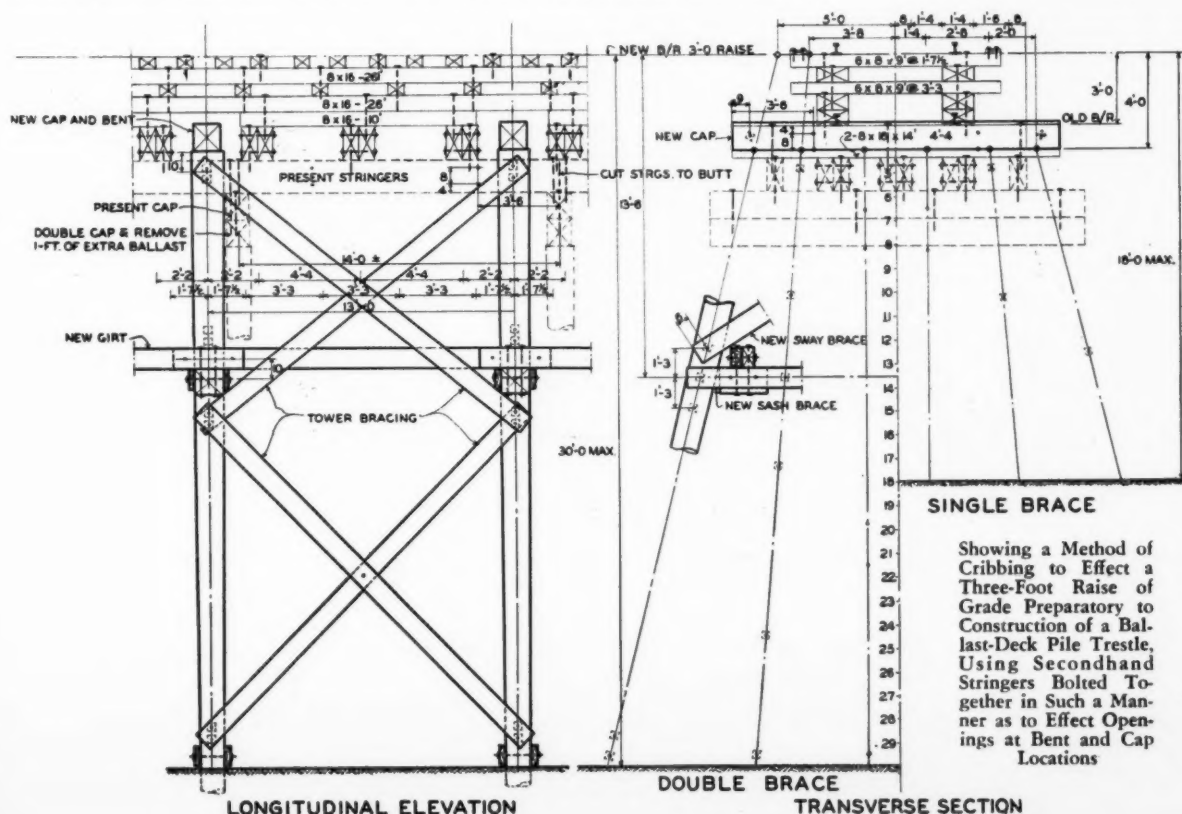
On trestles more than 10 ft. in height, a stringer, laid flat on the ends of the caps, and butt joined and drifted to the caps, should be installed to hold bents in line longitudinally with the track. Such flat stringers will serve also as a scaffold.

To meet required small raises in grade, shims will be placed on the caps. Where a raise in grade of more than 18 in. is necessary, it is better to leave the chorded stringers in place on the caps, and place cribbing

on top of the stringers. This can be done readily by placing a stringer flat, between the bottoms of the track ties and the top of the chord. The next lift can be made by placing bridge ties between the flat stringer and the top of the chord. The next and succeeding lifts will be made by alternating layers of stringers, placed flat, longitudinally, and bridge ties placed transversely, until the desired elevation has been obtained. The cribs must be planned and built to permit proper placing of the piles with a minimum shifting of timber. The location of caps in the new bridge should also be determined, and spaces left for such caps, as far as is practicable. The timbers of the cribs must be drift-pinned together sufficiently to insure safety.

The accompanying drawing shows a method of cribbing that has been used successfully, and which varies from the described plan in that secondhand stringers, bolted together, were used within the cribs to effect openings in the cribs at bent and cap locations.

After the track has been brought to final grade, the piles should be driven. They should be unloaded adjacent to the end of the bridge opposite the end from which driving will start. If a bridge is located more than two miles from the nearest siding, the traffic is dense, and



a self-propelled driver is used, it is desirable to build a spur track to permit prompt clearance for trains—this is especially desirable if the bridge is 10 or more panels long.

Piles of the same lengths should be unloaded separately to facilitate heading and sharpening (when done), and to insure picking up the proper length of pile. The driver should pick up the pile to be placed in the opposite dump bent, move across the bridge, and drive it accurately to the required penetration. The center pile, or intermediate pile nearest the center of the track, should be driven, followed similarly in each succeeding bent across the bridge, until one line of corresponding piles in each bent is in place for the full length of the bridge.

This procedure permits piles to be cut off to clear the track without interfering with the pile driver operations, as well as producing a better bearing value per pile in the completed structure. The only reason for driving each bent complete before starting another is to permit a framing gang to cap and brace immediately. The procedure described will permit a minimum shifting of chords and cribbing as may be required to place piles properly.

Capping and Framing

When the pile driving has been completed, a framing gang should start immediately to complete the structure. The piles must be pulled into true position and held until they are cut off and the new cap has been placed. It is to be understood that the use of a derrick and mechanized tools, the protection of timber by the field application of creosote, and the close observance of recommended practice, are desirable. The placing of caps will be followed by the application of sway and sash braces to complete the bents. The new backwalls should be installed at this time. After the bents are completed, the new stringers will be placed and floor plank installed, a panel at a time. Track ties will be supported by blocking, resting on the new floor plank. A good type of blocking is provided by stringers laid flat on the new floor plank. As the work proceeds, track ties must be anchored temporarily to the blocking, to insure the maintenance of line.

The stringers should be drifted, or fastened to the new caps, as each panel is completed, and the floor plank should be fastened to the stringers as the work proceeds. Where cribbing has been installed for a heavy grade raise, it should be removed from beneath the bridge as

the deck installation progresses, and carried back along the track, to reduce the fire hazard. After the placing of the floor plank, the outside ballast retainers should be installed. If bridge ties are still in service, they should be replaced with track ties. Ballast should be applied heavily, particularly in the center of the track, after which the blocking for tie supports can be removed, and the track brought to an even bearing on the new deck. The final unloading of ballast will then be made, and the track will be raised to the established line and surface by the track forces.

The bridge forces should now install girts and tower bracing, where they are required. The old sway and sash braces, caps, and girts should be removed. These may be lowered to the ground and piled adjacent to the bridge to facilitate loading by a locomotive crane. Old piling will be cut off, preferably one foot below ground level. Piling that may be suitable for further use, such as for platform foundations, foundation piling for masonry, or for falsework, should be loaded by a locomotive crane. Any timber of no further value, that is to be burned at the bridge site, should be dragged to a point not less than 100 yd. from the new structure and, during the burning, should be watched until the wood is completely consumed.

After completion of the work, it is desirable to have a bulldozer level off the ravine and general ground elevation at the bridge site. Due to cleaning around the piling, through a long period of years, there usually is a ridge on each side of the bridge, which constricts the waterway and has the effect of lowering the efficiency of the structure.

It must be assumed that the bridge forces will be supervised properly and that they will observe instructions, and operating, timetable and special rules at all times.

Penna. Makes Its Track Awards

FOLLOWING customary practice on the Pennsylvania, letters of commendation have been sent by their superior officers to those supervisors of track whose territories were maintained to the highest degree of excellence in 1945. The information on which the ratings were based was obtained by periodic inspections made

during the year by special track inspection committees, headed by the chief engineer—maintenance of way of each region.

During these inspections, the territories of the various supervisors of track were rated for line, surface and general improvement. The names of the supervisors and their assistants (where they have assistants) who received letters of commendation are as follows:

New York Zone—New York division—S. M. Rodgers, Trenton, N.J., and D. G. Avoletta (assistant). Long Island railroad—W. L. Steltzer, Jamaica, N.Y.

Eastern Region—Maryland division, main line—L. L. Harding, Jr., Wilmington, Del., and S. C. Lyons (assistant). Maryland division, branch line—Wilmer Wallace, York, Pa. Middle division, main line—W. N. Myers, Huntingdon, Pa., and W. G. Romig (assistant). Middle division, branch line—D. M. Howard, Hollidaysburg, Pa. Philadelphia to Harrisburg, main line—M. Young, Jr., Lancaster, Pa., and M. E. Walker (assistant). Philadelphia division, branch line—J. T. Hartnett, Ernest, Pa. Philadelphia Terminal division—J. M. Minturn, Philadelphia, Pa., and J. V. Adams (assistant). Delmarva division—J. T. Evans, Salisbury, Md. Williamsport division—W. K. Mangum, Northumberland, Pa. Wilkes-Barre division—W. R. Dunn, Reading, Pa.

Central Region—Entire region—J. P. McGhee, Coshocton, Ohio, and J. W. Diffenderfer (assistant). Eastern division—C. P. Sipe, Pittsburgh, Pa., and Russell Pitts (assistant). Pittsburgh division, main line—N. L. Fleckenstine, Cresson, Pa., and H. M. Shoaf (assistant). Conemaugh division—H. W. Swartz, Blairsville, Pa. Monongahela division—O. L. Fisher, Youngwood, Pa. Buffalo division—G. A. Sargent, Olean, N.Y. Renovo division—W. M. McCracken, Erie, Pa.—Panhandle division—J. J. Stiles, Benwood, W. Va. Cleveland division—R. D. Jordan, Orrville, Ohio. Erie and Ashtabula division—H. W. Seeley, New Castle, Pa.

Western Region—Chicago Terminal division—W. B. Blix, Colehour, Ind., and V. F. Grubaugh (assistant). Fort Wayne division—E. B. Kirchner, Lima, Ohio. Logansport division—John Nowvickie, Crown Point, Ind. Toledo division—D. DeVore, Marion, Ohio. Grand Rapids division—Harry Hill, Cadillac, Mich. St. Louis division—H. J. McNally, Greenville, Ill. Indianapolis division—J. B. Hill, Indianapolis, Ind.—Columbus division—A. J. Roper, Richmond, Ind. Cincinnati division—A. F. Roper, Morrow, Ohio.

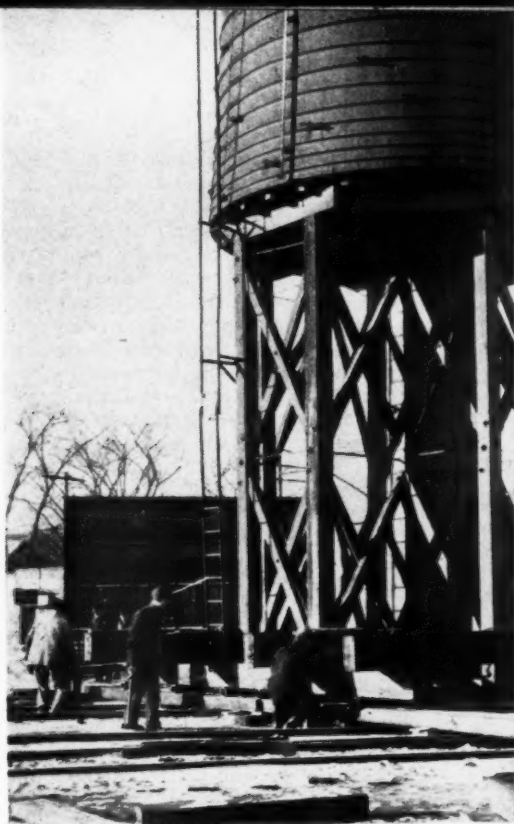
Maintaining Water Service Facilities—

Tanks

Part II

By C. R. KNOWLES

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The Method to Be Followed in Moving a Tank Will Depend on the Conditions Encountered

CHANGES in operating conditions, such as extended locomotive runs, larger engine tenders, rearrangement of tracks and other facilities, often necessitate the relocation of water tanks. The method to be followed in moving a tank will depend upon the distance it is to be moved, the clearances and the condition of the ground. Providing that the new location is within a reasonable distance, that the required clearances can be obtained and that the ground is fairly level, the tank can usually be moved intact. The method fol-

lowed in moving a tank without dismantling it is similar to that used in moving buildings. The tank is jacked up off the foundation and placed on stringers, and suitable track timbers are provided which should be firmly supported on a good foundation. Rollers of uniform size should be used to avoid distortion of the frame and tub, and possible damage to the chime.

A 100,000-gal. wood water tank on a Chicago terminal was moved across six busy main line tracks in this manner. The time required for the actual movement was less than 40 min., although the entire job, including raising the tank and placing it on the stringers, and seating it on the new foundation, required the better part of two days.

Small tanks may be moved intact on cars, provided the diameter and height are not such as to result in an unwieldy, unbalanced load. In one instance, a 50,000-gal. steel tank and tower were moved a distance of 12.3 mi. by rail; in this case the track was straight with a level grade for the entire distance, and there were no structures to interfere with the movement. High switch stands, whistling posts and flanger signs were removed and replaced. In another case, a 16-ft. by 24-ft. tub, complete with roof, was removed from the frame, loaded on a barge and towed over 100 mi. to a new location. These practices are not generally to be recommended, how-

ever, as the element of chance is against such undertakings.

It will prove more economical in nearly all cases to dismantle the tank and re-erect it at the new location, except where it is to be moved a short distance over level ground. Wood tanks of standard construction can be readily dismantled and re-erected at a reasonable cost, as all parts of such tanks are interchangeable, and, with the possible exception of the foundation and parts of the frost box and roof, can be re-used. Steel tanks are a more difficult matter as they require more care in dismantling and erecting, and as a result are more expensive to move. The introduction of welding in tank construction, should reduce the expense of moving steel tanks.

Frost Protection

The frost protection required for water tanks, auxiliary piping, and outlet fixtures depends upon climatic conditions, the temperature of the water pumped and the amount of water used daily. A prolonged period of weather in the lower twenties is worse than a short period of below-zero temperatures, so far as the water in the tank is concerned. This is true especially when water

No. 17 of a Series

This is the second section of a two-part article devoted to the maintenance of water tanks. Part I was mainly a discussion of the various parts of wood and steel tanks, including pointers to be observed in maintaining them. The present section discusses desirable practices in regard to moving tanks, providing frost protection, painting and cleaning them, and protecting them from fire. The next installment in the water service series will deal with water columns.

is pumped from surface supplies and is at near-freezing temperature when it enters the tank. When a large quantity of water is used daily, as, for example, where the daily consumption equals or exceeds the capacity of the tank, the ice formation is much less than when only a relatively small amount of water is used. More frost protection is required when surface water is used than when the water comes from wells as the temperature of well water is usually above 50 deg. F., while the temperature of surface water is often only slightly above freezing.

Frost boxes with an adequate number of air spaces should be provided in the colder climates. They should always be maintained in a tight condition. The walls or partitions should be constructed of dressed and matched lumber and lined with heavy building paper to make them as air tight as possible. The foundation of a frost box should extend below ground-frost penetration to secure the benefit of the radiation from the earth.

Wherever possible, artificial heat should be dispensed with as stoves

in frost boxes are responsible for a large percentage of the tank fires. Where frost boxes are not used, all exposed piping should be protected with wool felt, or other insulating material, with a weatherproof outside covering.

Goose necks and outlet pipes to tank spouts will usually give little trouble from freezing if the tank valve does not leak. It is important, therefore, that these valves are maintained in good condition. Automatic float valves should be placed below the water level to avoid freezing. Altitude valves are preferable to float valves in extremely cold climates.

Painting

As a rule, water tanks should be painted at intervals of four to six years. This applies to both steel and wood tanks. The object in painting a wood tank is more largely for appearance than protection, except for the roof, tower, hoops and other steel and iron work. The interior of the tank does not require painting except when necessary to prevent leakage. The staves and bottom planks of a

wood tank are always saturated with water, which arrests decay. The roof is subject to condensation and to a hot humid condition during the summer, which promotes rapid decay. If untreated lumber is used, it should be protected against decay by painting.

The paint used for wooden tanks is not always suitable for the protection of iron and steel. The hoops and other hardware should be given the same protection as steel tanks.

Steel tanks should be painted every four or five years to secure maximum life, as well as to keep repairs to a minimum. Where a tank is subjected to severe atmospheric conditions, such as smoke and gases at locomotive terminals, spray near salt water or a damp humid climate, more frequent painting will be necessary.

A steel tank should be thoroughly cleaned before applying paint. All rust and scale should be removed with wire brushes, scaling and chipping tools or by sand blasting. Old paint need not be removed when it is in good condition; and when the old paint is in fair condition, only one new coat may be required. It will usually be found, however, that, after cleaning, certain parts of the steel will show corrosion and these areas should be spot-painted or primed with red lead before applying a full coat.

When to Paint

It is unnecessary to empty the tank when painting the exterior, but no attempt should be made to apply paint to steel tanks when the relative humidity is high and the temperature of the water in the tank is lower than atmospheric temperature. If this situation prevails, the air immediately surrounding the tank will become chilled and will deposit moisture on the surface of the steel, in the same manner as dew is deposited during the night, resulting in what is commonly termed "sweating." The best time to paint a steel tank is in the fall, as during this season the atmospheric temperature is usually lower or near that of the surface of the steel and sweating will not occur. Also the relative humidity is lower, and sweating is less likely to occur even if the temperature of the tank surface is less than that of the air. Under no circumstances should paint be applied over a wet surface, as it cannot be made to adhere; therefore,



The Walls of Frost Boxes Should Be Constructed of Dressed and Matched Lumber and Lined With Heavy Building Paper

it is entirely impractical to paint over a sweating surface.

It is invariably found that the interior of a steel tank is in worse condition than the exterior. This may in some cases be charged to the character of the water, but it is largely due to the fact that the inside of the tank does not receive the same attention as the outside. This apparent neglect is unavoidable in most instances.

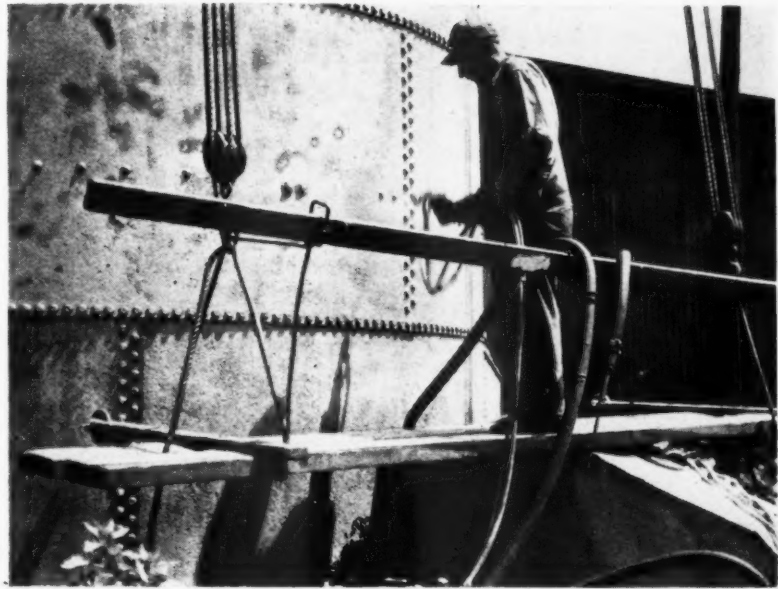
Taking a tank out of service for the time required to clean and paint the interior is serious in most instances. It requires at least one day to clean the tank, another day to dry it out, a third day for the first coat of paint with two days more for drying, and finally, for best results, the final coat inside the tank should be allowed to dry at least one week before water is admitted. This adds up to a minimum of 12 days for the complete job. As a result, inside painting is often neglected. It is difficult to offer suggestions as to how the work can be handled successfully, for each location presents a problem of its own. It is important, however, that the tank be painted inside with the same regularity as on the outside if long life and reasonable maintenance are to be expected. It is sufficient to say that the painting of tanks should be planned and carried out with the least possible interference with normal operation.

The cathodic system of electrical protection of the interior of steel tanks has been used successfully in a number of water tanks. It is claimed that by its use the iron rust is gradually loosened from the steel and further corrosion arrested. This may constitute the answer to the problem of protecting the interior of a steel tank without taking it out of service for painting.

Staging

There is no well-established practice for providing staging for the painting of either wood or steel tanks, for the practice varies with different railroads and is governed largely by the facilities at hand. In some cases where a steel tank is equipped with a full-revolving ladder, the painting is done from the ladder. In other instances false work is erected to support the staging, this false work sometimes extending from the ground, and in other places from the chime or floor of the tank.

The most convenient and economical method of painting tanks is by means of a seat or stage supported by painters' falls, which consists of two pairs of woodshell tackle blocks,



Painting a Steel Tank With the Aid of a Suspended Stage

each pair having one single block with becket and one double block without becket, reeved with Manila rope spliced into the becket of the single block. Where the painter uses a seat instead of a stage, a single pair of blocks is used.

The objection to using a double pair of blocks with staging on a tank is the difficulty in swinging the falls far enough from the edge of the tank to permit using a stage of the required length. This can be overcome, however, by using a special jack or scaffold iron instead of the regular painters' cornice hoop, which will permit swinging the falls out from the edge of the tank. The scaffolding may be swung either from the pinnacle of the tank, with lines passing over the edge of the roof, or may be swung direct from the top of the staves of a wood tank or the rim of a steel tank.

Spray painting simplifies the problem of scaffolding for tanks, as extension spray guns six to eight feet in length can be used readily, permitting the sprayer to apply the paint on surfaces beyond ordinary reach. These extensions are so constructed as to permit positive, accurate control of the spray.

Avoiding Accidents

Every precaution should be taken to avoid accidents when painting tanks. Where painters' falls are used, the staging is usually raised and lowered by the men on the staging. The same is true where a painter's seat is supported by a fall. In every case, however, it is advisable to have

a man on the ground, both for the purpose of handling material and as an additional measure of safety. Where cornice hoops or scaffold irons are attached to the tops of the staves of wood tanks, precautions should be taken to see that the staves are in such condition that the hooks will not slip or pull through them. To avoid damage to the staves, they should be reinforced with straps of wood or iron. Where vertical ladders are used, the painter should be secured by a safety belt, and ladder jacks should be used where scaffolding is swung from a ladder.

The same rules will apply to the painting of the interiors of water tanks. However, the maximum corrosion on the interior of a steel tank will usually occur within the limits of the upper rings of the tank where the shell is alternately wet and dry, and in order to avoid taking the tank out of service it may be desirable to confine the painting to these upper rings for a distance of perhaps eight or ten feet down from the top. If this is done, a simple staging can be arranged on floats of kegs or small barrels, controlling the height of the staging by the water level in the tank.

Fire Protection

Although it is not generally realized, a wood water tank and tower present the same fire hazard as any other frame structure, and equal care is required in safeguarding against fire. An analysis of 17 tank fires on one railroad show that 10 of these fires resulted in the total loss of the

The Water Service Series

The 14 articles in this series, published previously, include the following:

- (1) Introduction (April, 1944)
- (2) (3) (4) Sources of Supply (May, June & July, 1944)
- (5) The Maintenance of Pumps — Reciprocating Pumps (Aug., 1944)
- (6) The Maintenance of Pumps — Centrifugal Pumps (Sept., 1944)
- (7) The Maintenance of Deep Well Pumps (Oct., 1944)
- (8) Miscellaneous Pumps (Dec., 1944)
- (9) (10) Power Units (Jan. & Feb., 1945)
- (11) Power Transmissions and Controls for Pumps (April, 1945)
- (12) (13) Pipe Lines (June & Aug., 1945)
- (14) (15) Valves and Hydrants (Oct. & Dec., 1945)
- (16) Tanks—Part I (Feb., 1946)

tanks. Six of the fires were started when thawing out pipe lines, three were the result of overheated staves, three more were started by flying sparks, two originated from fires in adjacent structures, one resulted from carelessness in cleaning lamps under the tank, one was set by tramps and one started from a grass fire. Thirteen of the fires occurred during the winter. Four in November, three in December and six in January.

Must Exercise Care

The six fires (more than one third of the total) caused by thawing pipe lines accounted for over fifty per cent of the total loss. This emphasizes the importance of exercising care in thawing pipe lines in frost boxes and under and around tanks. An open flame or hot coals should never be used, for this practice is extremely hazardous. Obviously, the facilities should be maintained in such condition that freezing will not take place, but if freezing occurs in spite of or in the absence of proper precautions, hot water or steam should be used for thawing purposes. A fire resulting in the destruction of the tank will cause a great deal more inconvenience than a frozen pipe.

The use of stoves for heating tanks and frost boxes should be avoided wherever possible because of the fire

hazard, which is present with even the best of installations. In most cases, the necessity for a stove can be overcome by a properly constructed frost box properly maintained. Electric heaters are sometimes used where electricity is available, but they are expensive to operate unless electric current is available at a sufficiently low rate.

Stove Requirements

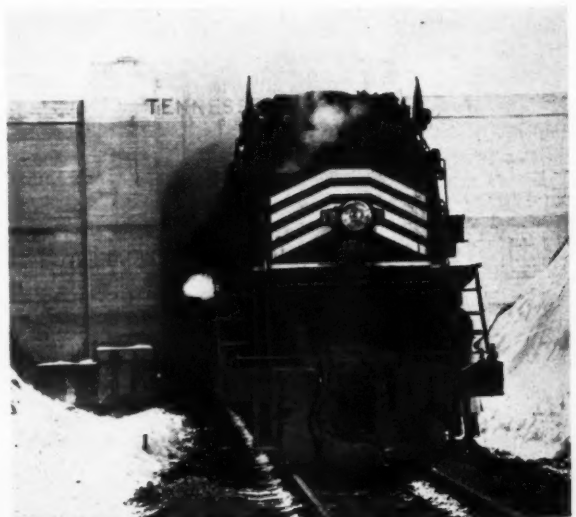
When a stove is used, it should be kept in good condition. A common fault is to install a stove that is much too large for the requirements. A small brooder stove that is designed to burn for 24 hr. without stoking will give satisfactory results. A stove should be placed on a base constructed of iron or other fireproof material. The stove pipe in a frost box usually passes through the tank and should be constructed of standard wrought iron pipe. The walls of a frost box should be protected against fire with suitable fireproof materials when they are exposed to direct heat from the stove or stove pipe. Extreme care should be exercised to avoid overheating a stove. One man should be responsible for firing the stove, for haphazard firing by different men is undesirable.

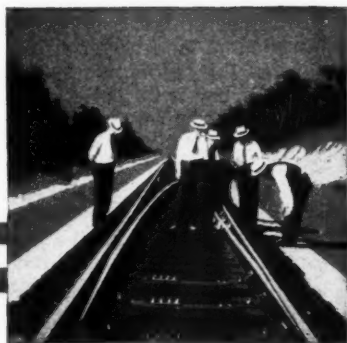
The ground around the tank should be kept clean and free from grass, weeds and debris of all kinds. The space under the tank should not be used for the storage of inflammable materials, and the storage of other kinds of material should be discouraged. Tramps should not be permitted to establish a "hobo jungle" under or around a tank because of the hazard of open fires. Bird nests should be destroyed, as they present a hazard from sparks.

The amount of suspended matter carried by the water usually determines the frequency with which flat bottom tanks should be cleaned. As a rule, where clear water is used, once a year will be sufficient. The tank should be emptied and inspected annually, regardless of the amount of suspended matter or the necessity for cleaning. When water is obtained from a stream carrying a considerable amount of suspended matter, or when treatment is applied directly in the roadside tank, more frequent cleaning may be required; it is good practice under such conditions to clean a tank at least twice a year; for example, after the fall rains and again in the late spring or early summer. The disposal of the mud from a tank sometimes constitutes a problem when the tank is located at a passenger station or in congested territory, in which case it should be loaded in tight-bottom cars and hauled away. When the water is used for drinking purposes, the tank should be washed thoroughly with a hose, and sterilized with hypochlorite of lime. When a conical bottom tank with mud drums is used, it should be flushed at least once each week and oftener if necessary to avoid an accumulation of heavy mud in the mud drum.

Pumpers or others in direct charge of water stations should be instructed to keep tanks full of water in order to prevent the shrinkage of staves, but should avoid overflowing the tanks. They should see that tank spouts and grab ropes are maintained at standard clearances. They should oil all sheaves and chains of tank fixtures once a month. They should, likewise, report any defects in spouts, valves or other appurtenances at water tanks.

Locomotive Emerging From the New Tunnel That Has Been Constructed by the Denver & Rio Grande Western Through the Rocky Mountains at Tennessee Pass





What's the ANSWER?

Overcoming Unstable Track

Where track in cuts or on light fills is unstable because of high ground-water table, what methods can be employed to overcome the trouble? Which is the most effective? Why?

First Make a Survey

By GEORGE E. SHAFER

Chief Engineer, Armco Drainage & Metal Products, Inc., Middletown, Ohio

High ground-water in cuts and on light fills, resulting in unstable roadbeds, is one of the most serious problems in modern railroading. Heavy loads and high speeds exaggerate the conditions. The trouble is obviously water and the problem is to remove it. Our experience in solving this problem has been confined to drainage and I will discuss this briefly.

Wet cuts are caused by water from snow, rain and seepage. An impervious stratum underlying the roadbed, which is usually the case in cuts, and light cut grades, make a perfect setup for high water tables. Subdrains have been used successfully for many years to lower water tables. A good example of this is agricultural drainage, where the object is to lower the water table just sufficient to maintain the proper mixture of air and capillary moisture in the zone of root growth. In roadbed drainage, it is imperative that the water table be lowered to a greater depth in order to stabilize the sub-grade. Because of the difficulty of maintaining surface ditches in cuts, it is usually advisable to install parallel subdrains in cut ditches. Such drains collect seepage water for their entire length as well as act as outlets for lateral drains placed under the track.

An accurate survey should be made with a soil auger for drilling exploration holes to determine (1) the source of the water; (2) the height of the water table; and (3) the depths and grades of subdrains. Both the lateral and parallel drains function best on

relatively steep grades, which should be 0.3 per cent or more. From the information developed by the survey, a drainage system can be designed to lower the water table in a cut to a desired point. Although it is desirable to lower the water table in certain types of subgrade material to four feet below base of rail, this depth should not be arbitrarily adopted for all kinds of subgrade material because of the difference in supporting value and capillary action of soils.

An effective drainage system for many cuts is a parallel drain of eight to ten-inch diameter pipe placed on the wettest side of the track and having six-inch diameter pipe laterals on 30-ft. centers. Pipe should be perforated, in long lengths securely connected, made of material that will not break or disjoin by soil movement or when under load, and of sufficient durability to warrant its use economically. Corrugated perforated iron pipe has been used successfully as underdrains for more than 20 years.

A special filter material, graded so that water will pass through it slowly, should be used for backfilling all drain trenches in order that soil will not be washed into the pipe. Ordinary concrete sand as specified by the American Association of State Highway Officials is satisfactory in all but a very few special soils. The porous backfill should be carried to within 6 to 12 in. of the top of the trench. The top of

To Be Answered in June

1. How far inside the rail should ties be tamped? How far outside? Why? Does the amount of the raise, the size of the tie or the kind of ballast make any difference? Should the tie be tamped from one or both sides? Why?

2. What measures can be employed to protect the concrete in cinder pits from injury from the operation of clamshell buckets when removing cinders?

3. To what extent are slow orders necessary when giving the track a general raise? Do shortened train schedules make any difference? The character of the ballast? The amount of the raise? If so, what?

4. What essential characteristics should priming coats for steel surfaces possess? Body coats? Finishing coats? What is the importance of each?

5. What are the relative merits of hand-operated hack saws and track chisels for cutting rails? Power saws? Does the size of the rail make any difference?

6. What methods can be employed to detect and prevent water waste? Who should be responsible? Why?

7. By what simple method can one determine in the field the degree of a curve? How accurately can this be done?

8. What are the advantages of flue linings? The disadvantages? Is it worth while to apply them where not required by ordinance?

the trench should be sealed with fairly impervious soil and the surface water should be taken care of with ditches or conducted to the drain through surface inlets.

Lowering the water table in light fills is done by intercepting the water and providing outlets much the same

Send your answers to any of the questions to the What's the Answer Editor. He will welcome also any questions you wish to have discussed.

as in cuts. It is practical in some soils to provide outlet drainage through deep side ditches, with the lateral drains flowing into these ditches.

Drive Stabilization Piles

By T. M. PITTMAN

Division Engineer, Illinois Central,
Memphis, Tenn.

It is assumed that the question does not apply to water pockets caused by local conditions, since these are discussed at length in technical and trade journals, but to a general unstable condition caused by high ground-water table. This condition is not a common one. Ordinarily, the most satisfactory remedy for soft track is drainage but, if the ground-water table is high enough to cause unstable track, it is probable that there is no suitable outlet for a drainage system, otherwise the table would not be so high. If the trouble is bad enough to justify the expense, a long line of tile or an open ditch could be extended to some distant outlet.

The cheapest and most satisfactory

remedy under average conditions would probably be to drive stabilization piles on both sides of the track on about 30-inch centers and as close to the ends of the ties as they can be driven. They should be driven well below the subgrade to avoid interference with ditching machines and should be long enough to penetrate stable material. In fills, they should be long enough to have as much of the pile below the surface of natural ground as there is above. These piles tend to compact the earth and give satisfactory support to the track. Sometimes they break through an underlying impervious ground stratum, permitting drainage through it to a pervious material, resulting in a lowering of the ground-water level.

The recent practice of forcing cement grout under the track might be beneficial if the soil condition is suitable, although this work appears to be more successful in curing water pockets than conditions being discussed here. At extremely bad locations, precast concrete slabs have been placed under the track with very satisfactory results, but this method should be used only in extreme cases.

the employee who is operating them. To overcome this barrier he must keep his mind on his work at all times. If he does this, protection against personal injury will become a habit, which will eliminate most of the personal injuries that do occur.

Summing up the situation, the precautions to be taken in the operation of power machines and power tools consist of providing, first, physical protection against the opportunity for personal injuries, in the form of guards around moving parts; second, suitable and adequate training of new employees by qualified employees; and third, intensive supervision to prevent, if possible, thoughtlessness and carelessness in the handling of the machines.

Carelessness Big Factor

By L. G. BYRD

Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

As recently as ten years ago relatively few railway officers appreciated fully the advantages that are inherent in the operation of power machines and power tools, or foresaw the extent to which they would shortly be compelled to rely upon them to get their work done. Neither did they foresee the changes in methods that would be necessary to obtain the greatest benefits from the use of these machines. Since then, an astonishing development has taken place in both equipment and in methods of maintenance.

New power machines and tools are now equipped with devices to guard against personal injuries. However, it is still essential, and will continue to be essential, that where a new design of equipment is purchased, an agent of the manufacturer be sent to instruct the foreman and the operator concerning the functions of the machinery and to make clear the directions for handling it safely.

The manner in which machines and tools are cared for and inspected is an important item in the prevention of accidents. No employee should be allowed to use a defective machine or tool, or any other device or appliance. Bad-order tools should be barred from the job until suitable repairs or replacement of parts have been made as necessary.

Defects in tools and machines cause more injuries than any other factor, except carelessness and failure to comply with rules. For this reason, as well as for other obvious reasons, power equipment should be kept in good condition, with all bolts well tightened. Where air hose is em-

Precautions with Power Tools

What precautions should be taken to insure that men using power machines and power tools are protected against personal injury?

Two General Divisions

By E. H. BARNEART

Division Engineer, Baltimore & Ohio,
Garrett, Ind.

The problem raised in this question naturally divides itself into two general divisions, first, where power machines and power tools are installed in shops, where close supervision can be maintained over them and the manner of their use; and second, where machines and tools are operated out on the road, where close supervision is not always practical.

I am sure that there is no disagreement that the operation of power machines and power tools in a shop under the direct supervision of a foreman is an entirely different situation from that for line-of-road operations. In the shop, the machines and tools can be protected adequately, and the operators can be cautioned constantly about their use. Naturally, where such machines are concentrated in a small area, the supervisor who can be with his men constantly has a much better opportunity to exercise more intensive supervision.

On the other hand, if we set out

against this the operation of the power machines and tools out on the line, we find that the picture is entirely different. Personally, I am more familiar with those machines and tools that are used for laying rail and for surfacing track than with the multitude of others that are designed for so wide a variety of purposes. In the first place, machines of this character should be provided with guards for the running parts: This matter should be checked by the supervisor and the guards provided before the machines are allowed to go into operation.

The most difficult part of the prevention of personal injuries when using power machines and power tools is the education of the operators. Needless to say, when a new man is learning to use a machine or tool, he should be given adequate instruction by a qualified operator. Yet it is the duty of the foreman to exercise as much personal supervision over the operation of the power machines and power tools as it is possible for him to do.

The greatest barrier against the safe operation of the machines and tools is the thoughtlessness and neglect of

ployed, which shows signs of leaks, the defective parts should be cut out and the hose spliced or it should be replaced with new hose. Tapes should never be used over these bad spots.

No employee, and this applies particularly to new employees, should be allowed to operate a power machine or a power tool until he is thoroughly familiar with its use and the danger that results if it is not kept in first-class condition.

Repair should not be permitted while the machine or tool is in operation. All power should be shut off and the machine brought to a dead stop before attempting to make either repairs or adjustments. Employees who must handle power tools on structures, such as rivet busters, hammers or drills, should be seated on scaffolds so designed that they cannot

fall off. The rigging should be composed of cables or chains where the scaffolds are fastened to steel structures or members.

If power tools are operated on or near tracks, a look-out man should be assigned to give warning of approaching trains. In addition, in some cases, such as on curves, especially in cuts, it may be necessary to have a slow order during working hours.

It is well to remember lubrication. All working parts requiring oil or grease should be watched closely to prevent accumulations of oil which may cause a fire. Where gasoline power tools are in use, the fuel should never be supplied until the machine is stopped and the current is cut off. A close watch must always be kept to know that the advance spark is set correctly to avoid back kicking.

rection is desirable or where constant speed is needed. The general application is on larger operations where continuous operation is involved.

There are no particular advantages in the use of synchronous motors in railway pumping plants, unless the foregoing factors are present. The disadvantages, so far as ordinary power requirements for pumping-plant work are concerned, are that synchronous motors are not inherently self starting, they have a small starting torque and are too complicated for the purpose.

For Constant Loads

By A. B. PIERCE
Engineer Water Supply, Southern,
Washington, D. C.

A synchronous motor is an alternating-current motor which runs in synchronism with the generator to which it is connected. This type of motor requires a source of direct current for field excitation. It is adapted for use where the load is more or less constant, when the power-factor correction is necessary, and is used more particularly where the horsepower requirements are 20 or higher, and slow-speed motors are desired.

There are no particular advantages in the synchronous motor in ordinary cases at railway pumping stations unless the power factor needs correction. The disadvantages are that it requires an exciter and more elaborate and expensive electric-control equipment than is required for induction or squirrel-cage motors. The synchronous motor is not adaptable or suitable for automatic operation, which is the type of operation now generally employed at railway pumping stations. At present, few, if any, railways use this type of motor at automatic pumping stations. It is used sometimes for operating air compressors and where the power companies require this type of motor.

Are More Expensive

By G. S. CRITES
Division Engineer, Baltimore & Ohio,
Baltimore, Md.

Synchronous motors are electric motors using alternating current for power, but which are equipped with direct-current exciters, which causes the motor to follow the exact cycle of the generator. They have no brushes and are safe against explosions in unventilated places. They have high efficiency and operate at a power factor of 1, 0.9 or 0.8, and thus allow

What Are Synchronous Motors?

What is a synchronous motor? For what service is it adapted? What are its advantages for pumping water? Its disadvantages? To what extent are they used in railway pumping?

Have Low Starting Torque

By SUPERVISOR OF WATER SERVICE

A synchronous motor is one that revolves at constant speed or at the same speed as the generator which supplies the current for its operation; or at a division or a multiple of the speed of the generator. Ordinary synchronous motors have a low starting torque and are not well adapted for service where the motor must be started and stopped at frequent intervals. The principal advantage of synchronous motors is in the correction of the power factor in the supply line. The earlier types were not inherently self starting and, in some cases were equipped with auxiliary motors or an amortisseur or starting winding to bring them up to speed. Advancement has been made in the starting characteristics of synchronous motors in recent years, which have made it possible to obtain relatively high starting and accelerating torques, that compare favorably with the starting characteristics of induction motors.

The ability of the synchronous motor to correct the power factor of the supply line was advantageous at the time when the power factor of many electric power lines was extremely low. However, with the improvements that have been made in power transmission lines, they are but little used at present, in the smaller sizes that are most suitable for the average railway pumping station. Motors of the

synchronous type are specially suitable for driving fans, air compressors and centrifugal pumps, and for service demanding 20 or more horsepower and continuous operation. They are inherently low-speed motors which give best results where they can be operated without interruption. Synchronous motors are also used when it is necessary to comply with the power company's requirements.

The squirrel-cage induction type of motor is used more commonly in railway pumping service because it is simple and is adapted for the varying requirements of such service. In the larger sizes squirrel-cage motors have high efficiency, developing as much as 90 per cent at full load. They also are designed to have high starting torque with low current and high acceleration for use on elevators, cranes and for other intermittent service where the motor must start a heavy load frequently but run for short periods only.

Correct Power Factor

By W. D. GIBSON
Assistant Engineer, Chicago, Burlington &
Quincy, Chicago

When alternating current is supplied to an alternator which is in synchronism with the supplied current, the alternator becomes a synchronous motor. Synchronous motors are used principally where power-factor cor-

power companies to give their lowest rates for the power that is supplied to them.

They are particularly adapted for situations where constant speed is desired under all conditions of load, such as for air compressors or water pumps. However, synchronous motors are more expensive and require more wiring than induction motors, for which reason the latter are used in smaller plants, because of their ability to meet varying requirements.

Synchronous motors are used almost exclusively on large air compressors where the load may vary quite

largely from time to time. In such installations the motor is designed to fit the service and to operate at or near the power-unit factor, with a consequent saving in power consumption. For the same reason, they are economical on large water lines that are subject to varying heads or that have a varying flow.

Generally, the electrical department should pass on the type of motor to be used, after careful study of the requirements to be met. The costs of original installation, power consumption and everyday upkeep and maintenance must be considered.

How Often to Surface Track

How often should track be surfaced out of face? What are the indications that such surfacing is needed?

Local Conditions Decide

By L. J. DRUMELLER
Engineer of Track, Chesapeake & Ohio,
Richmond, Va.

The interval between periods of surfacing track out of face vary with local conditions, especially traffic density and permissible maximum speeds. Track in heavy-traffic territories with higher speeds requires more frequent surfacing to maintain line, surface and cross level, than track in territories with lighter traffic and slower speeds.

Heavy and fast train operation produces the following adverse track conditions: (1) rail wear due to flange cut rails on high side of curves, mashing on the low sides and burnt spots resulting from slipping engine drivers; (2) mechanical damage to ties as a result of frequent gaging and settlement of plates into ties, requiring heavy adzing; and (3) sloppy ballast caused by vibration at burnt spots on rail, battered joints, corrugated rail wear on low side of curves, front end sparks and heavy sanding. Heavy renewals of rails, ties, or ballast usually necessitate the surfacing of track and such renewals should be made just prior to, during or immediately subsequent to the work of raising the track.

The fact is pretty well established that periodic smoothing and correction of cross level minimizes the frequency of cycles in which track is surfaced as well as producing a better riding track. The track foreman checks his cross level and gage with a level board and the usual track gage but he often has to depend on his eye to check the line, which is difficult to do particularly on sharp curves. This has led me to the belief that greater efficiency

can be obtained and the cycles between surfacing operations prolonged, if some system could be established for setting permanent metal center markers about every 50 ft. on curves and 200 ft. on tangents, at all places where the roadbed is stable, and having the figures of the established super-elevation stamped with a metal die on the outside ball of the high rail directly opposite each curve stake.

This system would provide a means whereby the foreman could check the cross level, line and gage with one tool and in one operation so that he could correct any deviation before it progresses to the point where it would cause uncomfortable riding and necessitate a general re-surfacing, and possible renewal of the rail.

We have all been talking about the necessary increase in speed to meet post-war competition and, in my opinion, such speeds are now beginning to be put into effect. Therefore, all the engineering help possible should be given the track foreman to assist him in building up and maintaining the track structure properly for high-speed operation.

Determined by Traffic

By R. MARSHALL
District Roadmaster, Great Northern,
Superior, Wis.

I do not believe that anyone can set a hard and fast rule in this regard but, assuming that the sub-grade is substantial and adequately drained, the rail and joint bars are in good condition, the ballast is clean and of sufficient depth, and the ties are sound, the frequency of out-of-face surfacing will be determined largely by the

standard of maintenance required for the tonnage and speed of traffic for which the track is maintained.

Clean ballast is essential to maintain track with good riding qualities, particularly at the higher speeds. Also, the character of the ballast, whether crushed rock or gravel, is a big factor. Ballast material that breaks down and disintegrates will foul itself, creating the same poor surface drainage conditions as exist in localities where ballast is fouled by cinders, coal, ore, limestone, engine sand or wind-blown dirt from prairies. Fouled ballast results in poor surface drainage and subsequently, in pumping rail joints and a general distortion of line and surface, ending in rough riding track and damage to the ties, rail and fastenings. It also induces an undesirable growth of vegetation within the ballast lines.

Where such a condition exists in rock ballast, we have the choice of either cleaning the ballast and spotting up the track or giving the track a two or three-inch out-of-face surfacing. With gravel ballast, it is usually economical and desirable to scrape up and cast out the dirt from the ballast surface and give the track a light spread of fresh, clean ballast followed by a two or three-inch out-of-face surfacing to restore good riding qualities, good surface drainage and, incidentally, a neat appearance.

Excepting the desirability of a light out-of-face surfacing that should follow immediately after the laying of new rail, the indications that such surfacing is needed will be observed ordinarily in the general track surface, line and gage. Also, it will be apparent when the track rides "hard," and seems "dead" because it has lost its resiliency and elasticity to absorb the impact and shock of traffic passing over it.

Several Factors Involved

By S. J. HALE
Superintendent, Norfolk & Western,
Roanoke, Va.

The necessity for surfacing track out of face is determined by several factors which may act singly or in combination. Frequently, track conditions may be improved materially by spot-surfacing or smoothing. However, this treatment is basically of a temporary nature and out-of-face surfacing is indicated as being necessary when it ceases to give the desired results. The principal factors which determine this need are: (1) center-bound or dead track; (2) stability of the roadbed; (3) type or class of ballast used; and (4) class and density of traffic.

Out-of-face surfacing is definitely the only cure for dead or center-bound track. To be effective, this treatment alone is not sufficient and frequently the construction of substantial berms and rebuilding of the shoulders is required to support the work done on the track.

Stability of the roadbed is a most important factor and is closely allied with adequate drainage. Where the roadbed material is unstable and has a tendency to work up into the ballast, the track will become foul in a short time and surfacing will be required much more often than where the roadbed is firm and unyielding. When inter-mixed with ballast, sub-grade material prevents good drainage. Poorly installed drainage facilities, which permit surface water retention in the ballast, will cause the roadbed to become soft and foul the ballast, although under more favorable drainage conditions the roadbed might be entirely satisfactory.

The type or class of ballast used is of great importance with respect to its service life. Hard, clean ballast that will not crush under traffic or by tamping will give a much longer service than types which do not possess this quality. Ballast that has a tendency to crush or otherwise deteriorate in use will result in dead track.

The class and density of traffic also have an effect on the service life of ballast. For instance, at localities where there is a heavy movement of coal, the small amount that blows or sifts from the cars will cause the ballast to become foul in a relatively short time. Grades over which the traffic moves are a factor too, because sand is used extensively and the pulverized sand falls on the ballast, blocking free drainage and resulting in foul track.

The conclusion naturally reached is that track needs to be surfaced out of face when it becomes dead and the ballast foul.

each side of the joint bars. They should not bear up against the joint ties because the rail movement will disturb these ties to the detriment of line and surface. Furthermore, if anchors are applied on ties throughout the length of the rail, the pressure of the running rail can be held more readily by the greater number of ties than it could by a few.

Rail anchors should be applied in rail-laying operations after the rails have been spiked down but before the expansion shims have been removed. With this procedure, the rails will be held securely in place and there will be no damage to it from rail kinks caused by tight joints or from rail end batter where joints are open. So I repeat, that anchors are one of the cheapest expenses of maintenance and that a sufficient number should be applied to the rail to hold it, regardless of any standard, and the results will be more service life to the rail, ties and ballast and fewer slued ties and rail kinks.

Rail Anchors per Panel

How many anti-creepers should be applied to a panel? Why? What effect, if any, do they have on the life of a rail?

Enough to Stop Creeping

By J. E. FANNING

Assistant to Chief Engineer, Illinois Central, Chicago

The number of anti-creepers required for single track, with traffic in both directions, is different from the number required for multiple track with traffic only in one direction. There are a number of other factors, such as grades, density of traffic, type of ballast, etc., that determine the number of anti-creepers that must be applied. It is evident that a sufficient number should be used to prevent the rail from creeping, if certain very undesirable results are to be avoided. That, in reality, is the answer to the question.

Under ordinary conditions, 10 anchors to a 39-ft. rail or 20 to a panel, will be required for single track. On multiple track, 8 anchors to a rail or 16 to a panel will suffice, except at locations where a number of train movements may be made against the current of traffic, in which event, two additional anchors to a rail length should be applied in the back-up direction.

It may be necessary to increase the number because of the grade, traffic and other conditions. The application of a sufficient number of anti-creepers to maintain uniform expansion at

joints will prolong the life of the rail materially and care should be taken to see that those that fail or become loose are immediately replaced. Utmost care must be taken to avoid damage to the rail base when putting them on and they should be applied so as to cause the minimum amount of damage if struck by derailed wheels.

Anchor Full Rail Length

By W. H. SPARKS

Inspector of Track, Chesapeake & Ohio, Russell, Ky.

Conditions affecting the number of anchors to be applied to a rail vary because of grades, traffic and other factors. Generally speaking, the only correct answer to this question is to put on enough anchors to hold the rails securely for all traffic conditions. Some railroads can obtain satisfactory results against rail creepage by the application of only four or six anchors to a rail length and other roads require 12 or more. Since rail anchors are the cheapest appliance in track maintenance, the application of enough anchors should not be limited because of any standard. In my opinion, anchors should be applied throughout the full length of the rail, beginning not less than two ties on

Anchor Every Tie

By RETIRED ROADMASTER

My entire track experience has been on single track in desert country with severe temperature changes daily. Our rail generally moved forward on the fireman's side and we tried many methods of anchoring to avoid this movement. We tried four anchors to the rail,—then six, then eight, then ten and more, but the movement persisted although we were partially successful at a few places. No matter how we distributed the anchors on the rail, we still found rail movement, and sometimes in the direction opposite to that expected. Also, we found that the rail movement would change after the bolts were tightened and when the track was surfaced.

At certain points where we added anti-creepers to check rail movement, they would seem to be performing well and then some condition would cause a movement in the opposite direction and we had a job of re-setting them. My experience has led me to the conclusion that there is only one way to hold rail and that is to anchor the rail at every tie for both directions, even though it is more expensive. Through rail movement, we lose the benefit of the expansion allowances that were made when the rail was laid and this may result in buckled rail. Other detrimental results are severe strains in rail; battered joints; chipped rail ends; frogs and switches out of line; curves hard to maintain; extra welding expense; and greater labor expenditure. Since anchors are rela-

tively inexpensive, I think it would be more economical to anchor every tie. Also, when we apply anchors only at a few ties, we overload them, they

get pushed around in the ballast and this adds to our track difficulties. I think it would be cheap insurance to anchor the rail at every tie.

crete bases in some of our enginehouses, and this has been considered an improvement over brick, for the blocks are not broken so readily under the hard usage to which such floors are subjected. However, in the course of time such a floor also becomes irregular, possibly as a result of patching, and becomes a source of complaint.

During the last two decades, 6-in., heavily-reinforced concrete, or 8-in. plain concrete floors have been built in our enginehouses, and are giving satisfactory results. Many of the older floors have been replaced by concrete, which we believe is easier to maintain and, in general, makes a better traveling surface for the shop equipment used in these buildings.

Floors in Enginehouses

Is it good practice to lay brick floors in shops or enginehouses without concrete bases? Why? How thick should the base be?

Not a Good Practice

By B. M. MURDOCH
Engineer of Buildings, Illinois Central,
Chicago

Although it is often done, it is not good practice to lay brick floors in shops or enginehouses without concrete bases. This is particularly true where trucking is likely to be employed, because it is practically impossible to eliminate unequal settlement and maintain a uniform surface, which is essential for trucking and general shop work, unless the bricks are supported on concrete.

In enginehouses, where considerable water is usually encountered on the floors, it is important that a substantial base be provided; otherwise water seeping through the brick joints into the ground will soften the base and this will result in unequal settlement, which will require that the floor be taken up and relaid.

The thickness of the concrete base will depend in large measure upon the character of the soil upon which it is to be supported, but under normal conditions a thickness of 6 in. should be satisfactory. If the soil conditions are not uniform, it will be desirable to use a road mesh in the base, to provide for uniform distribution of the floor loading.

As a concrete base is considered essential, it makes a brick floor quite expensive, and it is my observation that a good concrete floor will prove to be much better, and that it can be constructed at less cost than the brick floor on the concrete base.

Difficult to Maintain

By O. G. WILBUR
Assistant to Engineer of Buildings, Baltimore & Ohio, Baltimore, Md.

The construction of a brick floor without a concrete base in a shop or an enginehouse is definitely not good practice, as a floor in such buildings is subjected to extremely hard wear and such construction is difficult to maintain. Brick floors, even if on concrete bases five or six inches thick are hard

to maintain, as the dropping of heavy castings, and other such wear, cause the brick to be broken and, over a period of time, irregularity also develops in the floor.

We have used wood blocks on con-

Characteristics for Stringers

What characteristics are demanded for timbers that are to be used for stringers in trestles? What woods most nearly meet this requirement?

Must Have Girder Strength

By ENGINEER OF BRIDGES

The principal requirements for timbers in pile bridges, especially those for stringers and caps, are that they provide adequate girder strength and also that they will have long service life after being creosoted. To provide adequate girder strength, timbers should permit a design loading of not less than 1600 p.s.i. for new installations and a rating stress of 1800 p.s.i. Obviously, timber for these purposes should be straight grained and free from knots, shakes and other kindred defects. The wood should be sufficiently treatable to take full creosote treatment from its exterior to the natural pitch heart. There should not be excessive deflection under live load.

It has been my experience that longleaf pine is one of the species most suitable for use as stringers and caps. Prior to the general use of creosoted material, shortleaf pine was not used commonly as stringer material, because of its relatively short life when used untreated. However, when creosoted, shortleaf yellow pine has a service life comparable to that of the longleaf species. In this connection, it should not be overlooked that the supply of longleaf yellow pine is definitely limited.

Fir stringers have a reasonable service life, but it is my observation that they cannot be treated as successfully as the pine. I am also convinced that, even when creosoted, the

use of fir stringers should be confined to areas where there is less than 30 in. of rainfall annually. To insure satisfactory grades, it is my custom to require southern pine to conform to the specifications covering these species, issued in 1939 by the Southern Pine Association. For the fir, I follow the requirements of the West Coast Lumbermen's Association.

No doubt the continued decrease of available timber will increase the ratio of use of steel and concrete structures. At present the differential in the cost of bridges, between timber structures and so-called permanent structures, is decreasing at such a rate that, even in areas adjacent to available timber, it is often found to be more economical, considering all factors, to install the permanent type of construction.

Must Meet High Standard

By L. G. BYRD
Supervisor of Bridges and Buildings, Missouri Pacific, Poplar Bluff, Mo.

Stringers should be of selected grade and have strength to resist bending, and must also possess resistance to crushing, checking, warping and splitting, as well as to shocks. Hardwoods resist crushing and may have the strength necessary to resist bending, but they warp, check and split and, generally possess low resistance to shock. If knots or other defects appear in stringers, the stringers should be so placed that the de-

fects will occur in the compression area of the section.

Except in rare cases, softwoods are the most suitable and economical timber for stringers, for they have the strength to resist bending. Long-leaf yellow pine and Douglas fir stand at the head of the list, and give about equal results. However, the pine out-classes the fir with respect to longitudinal shear. Dense long-leaf pine also resists compression, wear and shock better than Douglas fir.

Must Have High Strength

By A. B. CHAPMAN

Bridge Engineer, Chicago, Milwaukee, St. Paul & Pacific, Chicago

Trestle stringers require a material that will develop high strength in bending and compression; that is resistant to decay and not liable to excess checking and cracking; and a material that can be treated readily with wood preservatives. Douglas fir and southern yellow pine are the two species used most widely for bridge

stringers. The existing stand of merchantable Douglas fir is the greatest of all species. It is found in trees ranging from 8 to 14 ft. in diameter. It can be treated readily with wood preservatives, provided it is incised.

Southern yellow pine for stringers should meet a similar requirement of the Southern Pine Association. Pine has quite a rapid growth, and it is expected that the supply will continue to be adequate for the smaller sized structural timbers. It can be treated readily with wood preservatives without incising.

In some parts of the country, where they are available, cypress or close-grained hardwoods may be used economically, although neither are as strong as pine or Douglas fir, for which reason larger timbers are required to insure the same strength against bending. It is my experience that treated pine stringers give the most satisfactory service; that they can be framed and installed at lower cost; that they have a longer service life; and that they give more definite indications of approaching failure than Douglas fir or the hardwoods.

added to fill the can. Then the can should be shaken thoroughly to insure a good mixture.

If the stores department mixed the oil with the gasoline and shipped the mixture to each foreman, it would add a considerable amount of work to that department and there would be no assurance that the mixture would be the correct one for all two-cycle engines, because the mixture is not always the same in engines of different manufacture and it is usually different in air-cooled engines, compared with water-cooled units.

Printed Instructions Are Important

By J. N. TODD

Superintendent Scales and Work Equipment, Southern, Washington, D. C.

The best assurance of a correct mixture of oil and gasoline is to have printed instructions placed in the hands of all persons concerned, and a copy of them in the tool house. The instructions should be clear and specific as to the quantity and S.A.E. number of oil to be used for the various engine models. An excellent plan is to have a tabulation made to show the grade of oil and mixture for each model.

The oil and gasoline should be mixed thoroughly and strained before pouring into the fuel tank. When breaking in new engines, about one-third more oil should be used. The mixing should be done at the tool house, rather than in the storehouse, because the fuel will then be used before the oil has had time to separate. Also, when mixed at the storehouse, larger quantities are used and the mixture is likely to stand for some time before it is all issued. However, there is no objection to mixing at the storehouse if the mixture is issued without delay to the tool houses.

Mixing Motor Car Fuel

How does one insure that the fuel for two-cycle engines on track motor cars contains the correct amount and grade of lubricating oil? Should the mixing be done at the tool house or at the storehouse? Why?

Mix at Tool House

By C. L. FERO

Supervisor of Work Equipment, Boston & Maine, East Cambridge, Mass.

The mixing of the oil and gasoline should be done at the tool house, either by the foreman or by a man assigned to that duty. It is necessary that all foremen to whom motor cars are assigned be furnished with the ap-

propriate measuring receptacles, as well as with instructions explaining fully the correct method of mixing, the amount and grade of oil to be used, and the necessity for keeping all containers and measuring cups clean.

A suitable safety-type gasoline can of three to five gallons capacity should be used. The correct amount of the proper grade of oil should be poured in the can first, and enough gasoline

The Twentieth Century Limited of the New York Central. Effective April 28, the Running Time of the "Century" Between New York and Chicago Will Be Reduced from 17 Hr. to 16 Hr., Returning It to the Pre-War Schedule



Products of Manufacturers

Crosstie and Backfill Tampers

THE Master Vibrator Company, Dayton, Ohio, has developed a new electric motor-actuated tie tamper known as Model ET-1, and a backfill tamper, either gasoline or electric-operated, Models G-1 and E-2, respectively.

The tie tamper, complete with tamping bar, weighs 70 lbs. and delivers 4,150 short, quick blows per minute. The blows, it is claimed, are not severe enough to shatter the ballast material and the vibration transmitted through the surrounding area causes the small particles of ballast to fall in the voids, assuring thorough compaction in all kinds of ballast. The machine is powered by a ½-hp., 110-volt, 3-phase electric tie

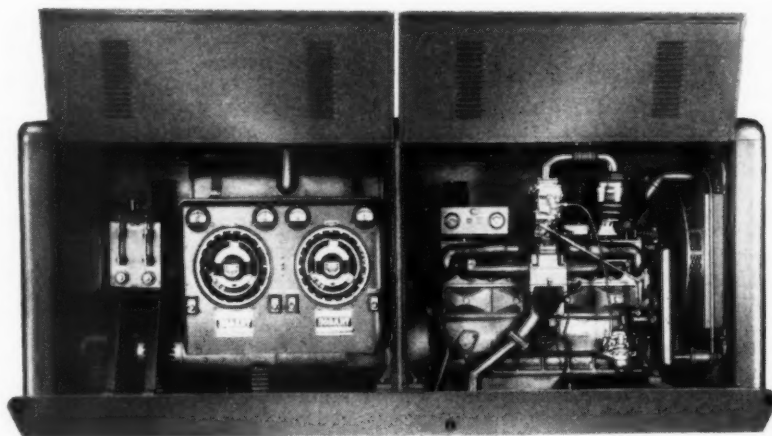


The Model ET-1 Electric Tie Tamper

tamper motor, but motors for special voltages, or cycles, can be obtained also. Several types of tamping bars are available for use with this machine, including the various standard types for rock, chatts, gravel and cinder ballast, and the toothed-types.

The backfill tamper is designed for compacting earth, gravel or slag fills

and asphalt or blacktop patching material for roadways. It is said that the tamper will deliver 5400 blows per minute to the seven by nine-inch tamping plate, producing firm and



The Two-Operator Gasoline-Driven Arc Welder

uniform compaction of the earth and a vibration effective for a radius of three feet or more. The self-contained gasoline model is powered by a Briggs & Stratton 1½-hp. engine operating at 3,600 r.p.m., and equipped with oil bath cleaner, gasoline filter, dust and moisture-proof high-tension flywheel magneto, governor, special gasoline tank, screened blower housing and muffler. Throttle control is mounted on the tamper handle.

The electric backfill tamper has a ½-hp. motor that will operate from any single-phase, 115 or 230-volt, 50 or 60-cycle power line, but other motors can be furnished on request for special voltages and cycles, in single or three-phase. The tamping plate is seven by nine inches with a shank eight inches long for the gasoline-powered unit and 15¾ in. long for the electrical model.

Arc-Welder

THE Hobart Brothers Company, Troy, Ohio, has announced the introduction of a gasoline engine-driven arc-welder designed to supply current simultaneously to two welders. This is accomplished by placing two 300-amp. generators on a common shaft and supplied with separate excitation from a common exciter. The double unit is directly connected

to an eight-cylinder Chrysler industrial engine. Since the engine maintains a constant speed for all loads, the two welding operators can work independently of each other. A paralleling switch is provided to change the unit effectively into a 600-amp. unit for a single operator. The engine and generators are completely covered with a housing equipped with side panels that can be raised to

give access to all parts for inspection and adjustment.

Since welding operations produce intermittent power loads, it is claimed that higher overall economy results from having the two units connected to one engine. This is because, with the two-unit arrangement, the net idle running time and service time of the engine are reduced, as well as maintenance costs. The manufacturer also points out that the generator paralleling switch gives the set more flexibility because of the 600-amp. capacity for heavy welding and cutting duty, which effectively doubles the welding range of the conventional single-operator unit.

New Book

Handbook on Welding

PROCEDURE Handbook of Arc Welding Design and Practice. Eighth edition. 1,312 pages, 6 in. by 9 in., 1,647 illustrations. Bound in simulated leather. Published by the Lincoln Electric Company, Cleveland, Ohio. Price \$1.50 in United States; elsewhere \$2.

This edition includes details of the most recent developments in electric welding methods, which have superseded and made obsolete many of the

practices that are described in previous literature on the subject. In compiling this information it has been the aim of the authors to provide complete information for those engaged in all fields of industry on the design and construction of parts and products, and on the technic of welding in these fields.

This revision of the handbook also includes 16 new subjects, among which are under-water cutting, shop

ventilation, maintenance of welding equipment and new cost tables. The book is divided into eight parts or chapters, four of which are of special interest to structural engineers and designers, namely, Weld Metals and Method of Testing; Welded Steel Construction; Designing Arc-Welded Structures; and Typical Applications of Arc Welding. A short section of the latter chapter is given over to rail-end welding.

correct. Beginning at the center, the spacing would then increase gradually to 24 in. off center at the point where the second short rail is laid. This is about as satisfactory as the results that are ordinarily obtained when laying short rails on the inside of the curve.

Facilitates Transposition

This simple expedient greatly facilitates the transposition of rail, because it permits the exchange of rail for rail and requires no extra material or rail cutting, besides which, trains can be allowed to pass at any time with only nominal delay, provided care is taken to maintain the correct expansion allowance. The expansion allowance on both rails should be checked beforehand and the same or a trifle thicker shims should be used when making the interchange of the rail between the two sides, but they should be the same for both sides. If thicker shims are used, the rail joints will run slightly ahead of their former locations, but they can be tapped back easily to match the old locations or to make a closure.

If the transposition is carried far enough out on the tangent at each end of the curve, there will be no chipped or pounding joints, and all rails will match exactly as they did before transposition.

The rail from the high side should not be reversed, but that from the low side should be, as was stated by Mr. Crites in his discussion of the question to which reference has been made. There are two reasons for this, one being that a better gage side is obtained, and the other is that the low rail, at least on the sharper curves, gets set in a curve which is the reverse of that in the track. This is a fact that is not always appreciated by trackmen, and I have had old experienced supervisors and section foremen refuse to believe this until confronted with visible proof.

The transposition of rail on curves is worthy of more consideration than it is usually given. If handled intelligently, it is frequently practicable to make rail last until necessary to lay new rail on adjoining tangents. This is particularly true on the higher curves and where rail and flange lubricators are used. To obtain best results, however, transposition should not be attempted on a very hot day. It is best to pick a day of moderate temperature, that is neither too hot nor too cold, say between 60 and 70 deg.

THOMAS WALKER
Roadmaster (Retired),
Louisville & Nashville

What Our Readers Think

On Transposing Rails

Asheville, N.C.

TO THE EDITOR:

I have read with interest the discussions appearing on page 1161 of the November, 1945, issue of *Railway Engineering and Maintenance*, in response to a question regarding the advantages of transposing rail on curves, compared with regaging. I have transposed a considerable amount of rail in my time and consider it highly advantageous for the several reasons given in the discussions. Almost always, however, I have found that one vexing factor in carrying out the operation was the presence of short rails on the low side of the curve, which are introduced normally for the purpose of obtaining the desired spacing of the joints.

These short rails cannot be transferred to the high side of the curve without leaving a short gap to be closed or without destroying the correct spacing of the joints. This difficulty can be overcome by having one or more full rails on hand for use on the high side in place of the short rails, and then by cutting rails from the high side to use on the low side. Obviously, this causes some extra work and a little confusion in an operation that should be carried out smoothly, because there is usually a time limit, within which the work must be completed.

A New Practice

What is more objectionable, however, is that these extra rails rarely match and cause lipped or pounding joints. These points led me to adopt a practice that overcomes these objections without any extra cost or the necessity for additional material. This must begin when new rail is being laid around the curve, which will probably be transposed later. I

laid full length rails on the low as well as on the high side of the curve. Obviously, this threw the joints increasingly off center, unless steps were taken to offset it.

As an example, assume a curve having a central angle of 48 deg. The outer rail will be 4 ft. longer than the inner rail, regardless of the degree of the curve, and the joints will be 48 in. off center at the far end of the curve, assuming that the joints were spaced correctly when starting around the curve. Personally, I do not see any serious objection to this, where 39-ft. rails are in the track, especially if the ties are not spaced to provide suspended joints. If any one does object to this spacing, the difficulty can be overcome easily by introducing a short rail on the tangent just before laying the low side. This rail should be short enough to compensate for one-half the discrepancy of the full distance around the curve. When the other end of the curve is reached, a similar short rail can be introduced on the tangent, and the correct spacing will be restored.

In the foregoing example, a 37-ft. rail would be laid on the tangent at each end of the curve. This means that the maximum amount that the joints would diverge from the correct spacing would be 24 in., starting around the curve. This would decrease 1 in. for each degree of central angle until, at the middle point of the curve, the spacing would again be



NEWS

of the Month



Railway Research at the University of Illinois

More than \$52,000 was given to the University of Illinois last year for co-operative research on railroad subjects. The three largest contributions in railway research during the fiscal year ending June 30, 1945, according to the annual report of the comptroller of the university, were: Association of American Railroads, for study of wheel loads, joint bars, and rail webs, \$12,366; Association of American Railroads and American Iron & Steel Institute, for study of failure in rails, \$18,522; and Technical Board of the Wrought Steel Wheel Industry, for steel car wheel research, \$10,000. Other subjects of study included welded joints and steel brake shoes.

New Steel Ceiling Prices Affect Railroad Supplies

Increases averaging \$5 per ton in steel mill ceiling prices for all basic steel products, including commodities essential to the railroad industry, were announced last month by the Office of Price Administration, and apply to all steel deliveries since February 15. The new mill ceiling price increases, which apply to both prime and secondary quality products, affect the following commodities, among others: structural shapes and piling, 25 cents per 100 lb.; rails, all types and grades, except light rails, \$5 per net ton; light rails, \$9 per net ton; splice bars, 15 cents per 100 lb.; tie plates, all types and grades, 25 cents per 100 lb.; wire fencing, 25 cents per 100 lb.; and track spikes, 40 cents per 100 lb.

Conference on Forest Conservation

The importance of perpetual forests to the railroad industry was emphasized at the conference of wood and paper users, forest industries groups and state and federal governmental agencies, sponsored by the American Forest Products Industries, Inc., in New York on March 1.

Colonel William B. Greeley, chairman of the trustees of American Forest Products Industries, mentioned the part played in Pacific Northwest tree growing by transcontinental railroads which operate two of the country's most promising and scientifically managed tree farms.

S. E. Armstrong, engineer maintenance of way-system of the New York Central

representing the Association of American Railroads, corroborated Greeley's statements that railroads, as land owners and tree farmers, are interested in sustained yield tree growth and continued traffic from forest lands.

R. E. Dougherty, vice-president of the New York Central, spoke briefly on the interest of the railroad industry in the tree-growing program and stressed the part which railroads are playing in the conservation and proper use of lumber.

Freight Car Loadings

Loadings of revenue freight for the week ended March 9 total 786,202, the Association of American Railroads announced on March 14. This was an increase of 3,805 cars or 0.5 per cent above the preceding week, an increase of 19,147 cars or 2.5 per cent above the corresponding week last year, and an increase of 5,937 or 0.8 per cent above the comparable 1944 week.

Net Income for January

Class I railroads in January had an estimated net income, after interest and rentals, of \$31,000,000, compared with \$39,048,188 in January, 1945, according to the Bureau of Railway Economics of the Association of American Railroads. The month's net railway operating income, before interest and rentals, was \$70,848,185, compared with the January, 1945, figure of \$76,041,453.

For the 12 months ended January 31, the rate of return on property investment averaged 3.04 per cent, compared with a rate of return of 3.97 per cent for the 12 months ended January 31, 1945.

Total operating revenues in January amounted to \$640,871,880, compared with \$750,911,171 in the same month of 1945, a decrease of 14.7 per cent. Operating expenses amounted to \$490,059,355, compared with \$530,045,245, down 7.5 per cent.

Building Again Restricted

Drastic curbs were placed on the construction and repair of buildings and structures beginning March 26, by the Civilian Production Administration, in order to free building materials and labor for veterans' home construction. The new regulation forbids the beginning of construction, or repairs or changes in existing structures, public or private, in the United States, with certain exceptions. It does not forbid con-

tinuance of work already begun on which materials that are to be an integral part of the structure have already been incorporated into the structure on the site. The prohibition applies whether or not the materials are on hand or are available without priorities assistance. "Structures" as defined by the order include, among others, buildings, piers and billboards, regardless of whether they are of a temporary or of a permanent nature. Also banned is the repairing, adding to, or altering of a structure, or the installation or relocating of fixtures or mechanical equipment, (heating, lighting, ventilating and plumbing) attached to or part of a structure.

The order does not apply to repainting, repapering or installing repair or replacement parts where no change is made in the structure itself. It does not apply to roads, streets, sidewalks, railroad or street or interurban or plant railway tracks or operating facilities, other than buildings, or to fences, bridges, wells, dams or canals. It does not apply to repair and maintenance work in transportation structures unless such work is capitalized for taxation purposes. It does not apply to the installation on the ground or outside of a structure of any kind of equipment not attached to the structure.

The order does not apply to construction, repair, alteration or installation jobs on a railway or street railway building when the cost of the job does not exceed \$15,000. In computing the cost of a job, the cost or value of equipment (other than mechanical equipment) and the cost of labor used to assemble or install this equipment may be excluded. The exclusion may not include the cost of heating, lighting, ventilating, or plumbing equipment within a building. Computation of the cost of the job must be based on the cost of the entire job, as estimated from the time of beginning construction, including paid labor, value of new equipment, except as outlined above, materials and contractors' fees.

Application for authority for railway construction jobs prohibited under the order should be made on a Civilian Production Administration form obtainable from and filed with the nearest district C.P.A. office. Factors which will be considered in granting authority to perform otherwise forbidden work are: (1) The essentiality of the proposed job in relation to the veteran's housing program, (2) the elimination of a bottleneck in reconversion, (3) the public health and safety of the community, and (4) unusual and extreme hardships.

Changes in Railway Personnel

General

A. B. Chaney, district engineer on the Missouri Pacific, with headquarters at Little Rock, Ark., has been appointed gerente general of the Gayaquil & Quito, with headquarters at Quito, Ecuador, S.A.

Robert J. Stone, assistant superintendent of the Birmingham division of the Southern, at Sheffield, Ala., and an engineer by training and experience, has been appointed superintendent, with headquarters at Selma, Ala.

J. Benton Jones, superintendent of the New York division of the Pennsylvania, at Jersey City, N. J., and an engineer by training and experience, has been appointed general superintendent of the Eastern Ohio division at Pittsburgh, Pa.

W. S. Hackworth, assistant to the president of the Nashville, Chattanooga & St. Louis, and an engineer by training and experience, has been elected president, with headquarters as before at Nashville,



W. S. Hackworth

Tenn. Mr. Hackworth was born at South Pittsburgh, Tenn., on July 14, 1896, and entered railroad service in 1916 as a track laborer on the Nashville, Chattanooga & St. Louis. On September 15, 1916, he was appointed instrumentman on the Chattanooga division, and on February 1, 1917, he was promoted to assistant division engineer of the Huntsville division. In January, 1922, he became assistant engineer in the office of the chief engineer, at Nashville. From January, 1926, to December, 1931, he served as assistant division engineer of the Atlanta division. On September 1, 1933, he was appointed assistant engineer in the real estate department, and in July, 1936, he was advanced to real estate agent. On October 1, 1939, he was appointed assistant to the president, the position he held at the time of his recent election to the presidency.

Clark Hungerford, general manager of the Western lines of the Southern, at Cincinnati, Ohio, and an engineer by training and experience, has been elected

vice-president in charge of operation and maintenance of the Association of American Railroads, with headquarters at Washington, D. C., succeeding **Charles H. Buford**, whose election as executive vice-president of the Chicago, Milwaukee, St. Paul & Pacific was announced in the March issue.

John Andrew Rogers, assistant general manager of the Central region of the Canadian national, with headquarters at Toronto, Ont., has been appointed general manager and chief engineer of the Central Vermont, with headquarters at St. Albans, Vt., succeeding **Roy D. Garner**, whose death on March 9 is reported elsewhere in these columns.

Engineering

Samuel W. McClure, assistant engineer on the New York Central, at Erie, Pa., has retired.

Edward B. Plant, assistant engineer on the Canadian Pacific, at Montreal, Que., has retired.

G. W. Griffin has been appointed assistant division engineer of the Bruce division of the Canadian Pacific, with headquarters at Toronto, Ont.

E. R. Hood, draftsman on the Canadian Pacific, at Montreal, Que., has been promoted to assistant engineer, with the same headquarters.

R. M. Nall, senior transitman on the St. Louis Southwestern, at Pine Bluff, Ark., has been promoted to valuation engineer, with headquarters at St. Louis, Mo.

W. P. Hale, instrumentman on the Chicago, Rock Island & Pacific, at Little Rock, Ark., has been appointed acting division engineer at El Reno, Okla., replacing **S. L. McClanahan**, on leave of absence.

W. W. Gwathmey, Jr., regional engineer of the Eastern region on the Baltimore & Ohio, at Baltimore, Md., has been appointed engineer of construction, with the same headquarters, succeeding **R. Mather**, who has retired after 34 years of service. **J. W. Jones**, senior assistant engineer at Baltimore, succeeds Mr. Gwathmey as regional engineer of the Eastern region.

W. N. Young, assistant to the chief engineer of the Baltimore & Ohio, at Baltimore, Md., has been appointed chief engineer of the Lakefront Dock & Railroad Terminal (a joint subsidiary of the B. & O. and the New York Central), at Toledo, Ohio, succeeding **K. J. Wagoner**, whose appointment as assistant chief engineer of the B. & O., at Baltimore, was reported in the March issue.

N. B. Reardon, whose retirement as engineer of buildings of the Canadian Pacific, at Montreal, Que., was announced in the March issue, was born in Brook-

lyn, N.Y., and went to Canada in 1912 to join the Canadian Pacific as civil engineer. In 1914 he was advanced to assistant superintendent of building construction, and in 1917 to assistant engineer of buildings. Mr. Reardon was promoted to engineer of buildings in 1937.

George L. Sitton, whose promotion to assistant chief engineer of the Southern, with headquarters at Washington, D.C., was reported in the February issue, was born at Anniston, Ala., on October 21, 1888, and was graduated from the University of Tennessee. He entered railway service as a rodman on the Southern at



George L. Sitton

Knoxville, Tenn., on June 13, 1902, and subsequently served as a laborer, transitman and assistant engineer. In 1913 he was promoted to assistant roadmaster at Greenville, S.C., where he remained until January, 1914, when he was advanced to roadmaster at Charleston, S.C. In July of the same year, he was appointed resident engineer at Richmond, Va., and in 1917 he was promoted to engineer maintenance of way, with the same headquarters. In 1918 Mr. Sitton was transferred to the Northern district, with headquarters at Danville, Va., and in December, 1924, he was advanced to chief engineer maintenance of way and structures of the Eastern Lines, with headquarters at Charlotte, N.C., which position he held until his recent promotion. Mr. Sitton is a past-president (1939-1940) of the Roadmasters' and Maintenance of Way Association of America.

B. H. Crosland, recently released from the armed forces, and former division engineer on the St. Louis-San Francisco, at Ft. Scott, Kan., has returned to that road as assistant chief engineer, with headquarters at Springfield, Mo.

H. J. Bogardus, assistant chief engineer on the Pere Marquette, at Detroit, Mich., has been promoted to chief engineer, with the same headquarters, succeeding **H. A. Cassil**, who has retired after more than 45 years of service. A photograph and sketch of Mr. Bogardus appeared in the issue of April, 1945.

H. B. Rutherford, whose appointment as assistant division engineer of the Eastern division of the New York Central, with headquarters at New York, was reported in the February issue, has been

transferred to the Pennsylvania division, with headquarters at Jersey Shore, Pa., and **H. A. Fredrickson**, supervisor of track at Brewster, N.Y., has been promoted to assistant division engineer of the Eastern division at New York, succeeding Mr. Rutherford.

Hilmar B. Christianson, whose promotion to assistant to the chief engineer of the Chicago, Milwaukee, St. Paul & Pacific, at Chicago, was reported in the February issue, was born at Minneapolis, Minn., on September 24, 1892, and was graduated from the University of Minnesota in 1915, with the degree of civil engineer. Upon completion of his education, Mr. Christianson went with the land department of the Northern Pacific, at St. Paul, later serving with the Soo Line in the valuation department at Minneapolis. On March 1, 1917, he entered the valuation department of the Milwaukee, advancing to assistant engineer prior to entering the armed forces during World War I. In January, 1919, he returned to the Milwaukee road's valuation depart-



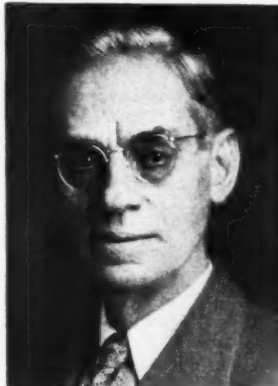
Hilmar B. Christianson

ment, where he remained until 1920, when he transferred to the engineering department as an instrumentman at Chicago. In 1922 he was advanced to assistant engineer at Beloit, Wis., subsequently serving in that capacity at Savanna, Ill., and Marion, Iowa. He was promoted to division engineer at Sioux City, Iowa, in 1925, later being transferred successively to Marion, Miles City, Mont., La Crosse, Wis., and Savanna. Mr. Christianson entered the Army in October 31, 1942, as a lieutenant colonel in the Engineer Corps and served 33 months overseas in the Pacific Theater of Operations. He was in charge of operation of the military railroad on Luzon, P.I., immediately following the landing at Lingayen, and in February, 1945, became head of the railroad section, Luzon engineer district and of the Engineer Construction Command. He was promoted to full colonel on December 20, 1945. Mr. Christianson was awarded the bronze star and oak leaf cluster for his work in the Milne Bay, P.I., area.

Arthur H. Chapman, whose retirement as assistant chief engineer of the Virginian, at Norfolk, Va., was announced in the March issue, was born at Staffordshire, England, on January 4, 1881. He entered railroading in 1905 as a drafts-

man for the Virginian, at Norfolk, Va. There he was advanced to architect in 1909, to assistant engineer in 1918, and then to office engineer in 1920. Mr. Chapman was appointed assistant chief engineer in 1931.

W. A. Spell, whose appointment as engineer maintenance of way of the Atlantic Coast Line, with headquarters at Atlanta, Ga., was announced in the Janu-



W. A. Spell

ary issue, was born on November 21, 1882, at Aurora, Tex. He entered railway service in 1906, in the engineering department of the Atlanta, Birmingham & Coast, rising to the position of chief engineer with headquarters at Atlanta, Ga. Mr. Spell was holding this position prior to his appointment as engineer maintenance of way on the A. C. L.

John W. Wallenius, whose appointment as division engineer of the Long Island was announced in the January issue, was born in Springfield, Mass., and was



John W. Wallenius

graduated from Yale University in 1928. He joined the engineering corps of the Pennsylvania in 1929 at Pittsburgh, Pa., and served as assistant supervisor and as supervisor in New York, Ohio, Indiana, and Maryland prior to his advancement to assistant division engineer of the Philadelphia Terminal division in 1943. In 1944 he was promoted to division engineer of the Renovo division at Erie, Pa., from which he was appointed to his present post at Jamaica, L.I., (N.Y.).

W. L. Hartzog, formerly engineer of design of the Atlantic Coast Line, has returned from military service and has been appointed assistant bridge engineer of that road, with headquarters at Wilmington, N. C.

Wesley F. Petteys, recently released from military service, has returned to the Erie as division engineer at Huntington, Ind., succeeding **Arthur Price**, who has been transferred to Dunmore, Pa. Mr. Price relieves **R. J. Pierce**, who has been appointed assistant division engineer at Marion, Ohio, replacing **J. G. Ainey**, whose appointment as track supervisor at Hornell, N.Y., is reported elsewhere in these columns.

R. F. P. Bowman, whose promotion to division engineer on the Canadian Pacific, with headquarters at Brandon, Man., was reported in the February issue, was born at Lethbridge, Alta., in 1904, and received his higher education at the University of Alberta. He entered railroad service in 1926 as a transitman on the



R. F. P. Bowman

Canadian Pacific at Cranbrook, B.C. In 1931 he was promoted to roadmaster at Empress, Alta., and served in that capacity at Aldersyde, Alta., and Lethbridge until August, 1940, when he went on leave of absence to serve in the armed forces of Canada, in which he rose quickly to the rank of major in the Royal Canadian Engineers. In May, 1943, he was appointed officer commanding the Second Railway Operating Company of the Royal Canadian Engineers, and in 1944 he was made deputy assistant director of transportation in the 21st army group. A month after D-Day he went to France as deputy assistant director of transportation at the First Canadian Army headquarters.

H. O. Waddell, whose promotion to division engineer of the Toronto Terminals of the Canadian National, with headquarters at Toronto, Ont., was reported in the March issue, was born in Port Hope, Ont., and entered railway service in November, 1930, as an instrumentman on the Canadian National at London, Ont. He later served with the Toronto Terminals Railway Company, and then returned to the C.N.R. In 1936 he was advanced to assistant engineer at Toronto, later being transferred succes-

sively to Capreol, Ont., Allandale, Ont., and the Toronto Terminals. In June, 1945, Mr. Waddell was promoted to assistant division engineer at London, Ont., which position he held until his recent promotion.

George A. Boyer, assistant division engineer on the Southern Pacific, at El Paso, Tex., has been appointed division engineer at San Antonio, Tex., succeeding **J. H. Knowles**, who has retired. **R. G. Schultz**, recently released from the armed forces and formerly inspector of bridges and buildings in the chief engineer's office at Houston, Tex., succeeds Mr. Boyer as assistant division engineer at El Paso.

Walter B. Kuersteiner, whose promotion to associate bridge engineer of the Louisville & Nashville, with headquarters at Louisville, Ky., was reported in the February issue, was born at Louisville on October 17, 1889, and received his technical education at Rose Polytechnic Institute. He entered railroad service in 1910 as a draftsman in the office of the



Walter B. Kuersteiner

chief engineer of the Louisville & Nashville, at Louisville, and on September 1, 1913, he was advanced to assistant engineer. After his release from the armed forces at the termination of World War I, Mr. Kuersteiner returned to the Louisville & Nashville in 1920 as assistant bridge engineer, the position he held at the time of his recent promotion.

C. E. Jackman, whose promotion to assistant engineer on the Baltimore & Ohio, at Cincinnati, Ohio, was reported in the March issue, was born at Byers, Ohio, on November 27, 1917, and graduated from Purdue University in 1940. He entered railroad service on June 15, 1940, on the maintenance engineering corps of the Baltimore & Ohio, at Cincinnati, and served in that capacity until the time of his recent advancement to assistant engineer in the office of the engineer, maintenance of way.

The following roadmasters on the Southern have been appointed division engineers, with the same headquarters, in connection with a change in departmental organization on that road: **J. F. Barron**, Hattiesburg, Miss.; **L. B. Craig**, Selma, Ala.; **T. Crawford**, Somerset, Ky.; **C. R. Gates**, Atlanta, Ga.; **W. B. Marshall**, Somerset, Ky.; **H. A. Metcalfe**, Birmingham,

Ala.; **R. B. Midkiff**, Sheffield, Ala.; **J. S. Moore**, Birmingham, Ala.; **J. A. Rust**, Greenville, S.C.; and **W. H. Wood**, Knoxville, Tenn.

C. H. Burks, whose appointment as assistant chief engineer of the Seaboard Air Line, with headquarters at Norfolk, Va., was announced in the February issue, was born at Natural Bridge, Va., on January 20, 1906, and was graduated from



C. H. Burks

Georgia School of Technology (B. S. civil engineering). He entered railroading with the Seaboard in 1933, as a bridge engineer on the Georgia division, later transferring to Hamlet, N.C., as assistant to the division engineer. Mr. Burks served at Savannah, Ga., and Atlanta, as master carpenter, then, in March, 1944, was promoted to division engineer at Savannah, maintaining this position until his recent advancement.

John C. Nichols, whose promotion to bridge engineer of the Louisville & Nashville, with headquarters at Louisville, Ky.,



John C. Nichols

was reported in the February issue, was born at County Corners, Iowa, on January 9, 1896, and received his higher education at Iowa State College, Ames, Ia. He entered railroad service on May 16, 1923, as a draftsman in the bridge department of the Louisville & Nashville, and served in that capacity until May 1, 1928, when he became assistant engineer. On February 15, 1930, he was appointed assistant bridge inspector, and on March 1,

1937, he was promoted to bridge inspector. Mr. Nichols was advanced to assistant bridge engineer on October 1, 1943, serving in that capacity until February 1, 1945, when he was advanced to associate bridge engineer, the position he held at the time of his recent promotion.

F. J. Bishop, whose resignation as engineer maintenance of way of the Toledo Terminal was reported in the March issue, has been appointed chief engineer of the Akron, Canton & Youngstown, with headquarters at Akron, Ohio, succeeding to the duties of **G. A. Haskins**, engineer maintenance of way, whose death on October 22 was reported in the January issue.

E. S. Birkenwald, whose promotion to engineer of bridges of the Southern, with headquarters at Cincinnati, Ohio, was reported in the February issue, was born at Milwaukee, Wis., on May 30, 1901, received his higher education at the University of Wisconsin and at Massachusetts Institute of Technology, and entered rail-



E. S. Birkenwald

road service on November 20, 1924, as a bridge inspector on the Southern at Charlotte, N.C. From June 1, 1925, to July 31, 1934, he served as assistant engineer at Charlotte. On August 1, 1934, Mr. Birkenwald was transferred to Knoxville, Tenn., as assistant engineer in the bridge department and served in that capacity until January 1, 1946, when he was promoted to assistant engineer of bridges, the position he held at the time of his recent promotion.

R. E. Copper, acting chief engineer of the Peoria & Pekin Union, has been appointed chief engineer, with headquarters as before at Peoria, Ill., succeeding **E. H. Thornberry**, who has retired.

G. H. Echols, assistant division engineer of the Atlanta division of the Southern has been promoted to division engineer of that division, with headquarters as before at Atlanta, Ga., and **W. H. Moore**, supervisor of work equipment at Charlotte, N.C., has been appointed assistant division engineer at Atlanta, to succeed Mr. Echols.

Clarence M. Gregg, whose promotion to assistant division engineer of the Mohawk division of the New York Central, with headquarters at Albany, N.Y., was re-

ported in the February issue, was born at Princetown, N.Y., on December 3, 1897, and was graduated in civil engineering from Union college in 1923. He entered railway service on February 27, 1924, in the engineering corps of the New York Central, at New York, later being transferred to Watertown, N.Y. In 1940 Mr. Gregg was promoted to assistant supervisor of track on the Electric division at New York, and two years later was appointed assistant engineer on the same division. In 1944 he was advanced to supervisor of track at Clearfield, N.Y., and in 1946 was transferred to Albany, where he was located at the time of his recent promotion.

E. C. Vandenburg, engineer maintenance on the Chicago & North Western, at Chicago, has been appointed chief engineer, with the same headquarters, succeeding **B. R. Kulp**, whose death on February 27, is reported elsewhere in these columns. **L. R. Lampport**, assistant to chief engineer, has been appointed engineer maintenance, succeeding Mr. Vandenburg. **B. R. Meyers**, office engineer,

the Madison division, with headquarters at Madison, Wis. On May 1, 1931, he was advanced to division engineer of the Northern Iowa and Sioux City divisions, with headquarters at Sioux City, Iowa, and on April 1, 1940, he was further advanced to engineer maintenance at Chicago, the position he held at the time of his recent promotion.

Mr. Lampport was born in Chicago on September 29, 1899, and was graduated from the University of Illinois in 1923.



L. R. Lampport

He entered railway service between terms of school in June, 1920, as a rodman on the North Western, at Chadron, Neb., later serving during summer vacations and after graduation as tapeman, rodman, instrumentman and inspector. In March, 1925, he went with the Illinois Central, serving as a rodman on location and maintenance, and in September, 1927, he returned to the North Western as an engineering accountant at Chicago. Mr. Lampport was promoted to assistant engi-

chief engineer, the position he held at the time of his recent promotion.

Mr. Meyers was born at Ames, Iowa, on April 3, 1903, and received his higher education at Iowa State College. He entered railroad service in 1918 as a bridge and building carpenter on the Chicago & North Western and served in that capacity during school vacations until 1925, when he became a draftsman on the Chicago, Rock Island & Pacific, at Chicago. From 1926 to 1928 he served as rodman and instrumentman on the Rock Island lines in Oklahoma and Kansas. On April 15, 1929, he returned to the North Western as an instrumentman at Boone, Iowa, and was promoted to assistant general bridge inspector at Chicago in January, 1930. Mr. Meyers was assistant engineer at Sioux City, Iowa, from January 1, 1937, to October 1, 1939, when he was appointed trainmaster. On April 1, 1945, he was advanced to office engineer at Chicago, the position he held at the time of his recent promotion.

Mr. Jensen was born at McHenry, Ill., on May 18, 1899, and was graduated from the University of Wisconsin in 1925. He



E. C. Vandenburg

has been appointed assistant to chief engineer, succeeding Mr. Lampport. **H. W. Jensen**, division engineer at St. Paul, Minn., has been appointed office engineer at Chicago, succeeding Mr. Meyers. **W. H. Huffman**, assistant division engineer at St. Paul, has been promoted to division engineer, with the same headquarters, succeeding Mr. Jensen.

Mr. Vandenburg was born in Audubon, Iowa, on March 26, 1887, and was graduated from Iowa State College in 1908. He entered railway service on July 1, 1908, as a chainman in the engineering department of the North Western, later serving as rodman, draftsman and instrumentman on location, construction and maintenance. On October 7, 1912, he was transferred to the signal department as an inspector, and a year later he was advanced to chief draftsman in the same department. From July 11, 1914, to January 1, 1916, Mr. Vandenburg served as assistant engineer on construction, returning to the signal department as assistant engineer on the latter date. Two years later he was appointed assistant general bridge inspector, which position he retained until April 7, 1924, when he was promoted to supervisor of bridges and buildings of



B. R. Meyers

neer on the Galena division in November, 1928, and in September, 1937, he was appointed supervisor of work equipment, with headquarters as before at Chicago. On April 1, 1940, he was promoted to division engineer of the Northern Iowa and Sioux City divisions, with headquarters at Sioux City, Iowa, and on December 1, 1940, he was transferred to the Galena division at Chicago. In March, 1943, he was advanced to assistant to the



H. W. Jensen

entered railroad service on September 21, 1925, as a rodman on the Chicago & North Western, at Chicago, and served successively as construction inspector, instrumentman, and assistant general bridge inspector, until January 1, 1930. After a year in private business, he returned to the North Western as construction accountant at Chicago, and served in that capacity until January, 1936, when he was appointed assistant roadmaster. From July 6, 1936, to November 1, 1938, he served as assistant engineer at Chicago. On November 1, 1938, Mr. Jensen was appointed assistant engineer on the Chicago, St. Paul, Minneapolis & Omaha (part of the Chicago & North Western), at St. Paul, Minn., and became division engineer on the same road on April 1, 1943, the position to which he returned after his release from the armed forces on January 1, 1946.

F. L. Thompson, whose promotion to assistant division engineer on the Baltimore & Ohio, with headquarters at Newark, Ohio, was reported in the March issue, was born at Lynch Station, Va., on January 6, 1902, and was graduated from the Virginia Military Institute in

1924. He entered railroad service on July 20, 1927, as a chainman on the Baltimore & Ohio, at Grafton, W. Va., and served in that capacity until 1929, when he became an assistant on the engineering corps at Akron, Ohio. From 1932 to 1935 he worked as crossing watchman, section foreman, extra gang foreman, carpenter, and water station attendant at various points in Ohio. In 1935 Mr. Thompson went on leave of absence to serve with the U. S. Army on dam construction in Ohio, and returned to the Baltimore & Ohio in 1937 as assistant on the engineering corps at Cincinnati, Ohio. In 1944 he was advanced to assistant engineer, with the same headquarters, the position he held at the time of his recent promotion.

L. H. Laffoley, whose appointment as engineer of buildings for the Canadian Pacific at Montreal, Que., was announced



L. H. Laffoley

in the March issue, entered the service of the C. P. R. as a draftsman in 1919 after two years overseas service during World War I. In 1926 he was advanced to assistant engineer, and became assistant engineer of buildings in 1938, serving in the latter post until his advancement on February 1.

Track

G. W. Harris, roadmaster on the Missouri Pacific, at Bay City, Tex., has retired.

W. J. Baldwin, inspector on roadway maintenance on the Norfolk & Western, has been promoted to assistant roadmaster on the Radford division, with headquarters at Pulaski, Va.

Hugh Price, roadmaster on the Chicago, Rock Island & Pacific, at Topeka, Kan., has been transferred to Chickasha, Okla., replacing **J. W. Shurtliff**, who has been transferred to Topeka, succeeding Mr. Price.

J. G. Ainey, assistant division engineer on the Erie at Marion, Ohio, has been appointed track supervisor at Hornell, N.Y., succeeding **Charles S. Bray**, who has returned to his former position of general foreman at Hornell.

Ray O. Miller has been appointed supervisor of track on the New York

division of the Lehigh Valley, with headquarters at Easton, Pa., succeeding **James F. Curry**, who has been transferred to the Wyoming division, with headquarters at Wilkes-Barre, Pa.

The following men have recently returned to the Pennsylvania from military service: **J. F. Piper**, appointed supervisor of track on the Maryland division; **E. M. Hodges**, appointed assistant supervisor of track on the Conemaugh division; and **J. L. Forrester**, appointed assistant supervisor of track on the Eastern division (Central region).

Edward Wollett, recently returned from military service, has been appointed assistant supervisor of track on the Pennsylvania at New Brunswick, N.J., succeeding **E. Rugere**, who has returned to his former position of general foreman on the Eastern region. **W. R. Kauffman**, also recently returned from military service, has been appointed assistant supervisor of track at Jamesburg, N.J.

C. E. Fox, general foreman on the Chicago, Milwaukee, St. Paul & Pacific, at Terre Haute, Ind., has been promoted to roadmaster, with the same headquarters, succeeding **A. F. Carlson**, who has been transferred to Horicon, Wis., relieving **A. H. Olson**, who has been assigned to other duties. **E. E. Long**, general foreman at Alexandria, S.D., has been advanced to roadmaster at Austin, Minn., replacing **F. F. Luskow**, deceased.

E. E. Gordon, acting roadmaster on the Bangor & Aroostook, at Houlton, Me., has been promoted to roadmaster at that point. Mr. Gordon was born at Milo, Me., and entered railway service on June 8, 1917, as a trackman on the Bangor & Aroostook. On November 17, 1932, he was promoted to section foreman and served in this capacity at various locations until September 17, 1945, when he was promoted to acting roadmaster at Houlton.

J. R. Kanan, roadmaster on the Chicago, Burlington & Quincy, at Galesburg, Ill., has been promoted to assistant engineer of track on the Ft. Worth & Denver City, with headquarters at Ft. Worth, Tex., succeeding **W. S. Broome**, whose promotion to assistant chief engineer was reported in the February issue. **R. P. Johns**, supervisor of track at Rochelle, Ill., has been advanced to roadmaster on the Beardstown division, with headquarters at Beardstown, Ill., replacing **A. B. Hutson**, who has been transferred to the Galesburg division, with headquarters at Galesburg, Ill., where he succeeds Mr. Kanan.

H. W. Wolcott, whose promotion to roadmaster on the Chicago, Burlington & Quincy with headquarters at Edgemont, S.D., was reported in the February issue, was born at Welfleet, Neb., on September 24, 1907, and entered railroad service on May 10, 1926, with the Burlington. In 1929 he became relief foreman on the Sterling division, and was promoted to section foreman on January 24, 1936. On December 28, 1942, Mr. Wolcott was advanced to track supervisor, with headquarters at Belmont, Neb., and two years later he was promoted to assistant road-

master, with headquarters at Edgemont. On December 1, 1945, he was appointed acting roadmaster, with the same headquarters, the position he held at the time of his recent promotion.

Owen H. Rhoads, supervisor of track on the Reading, at Lansdale, Pa., has retired, and **Pasquale Mignogna**, assistant supervisor of track on the Philadelphia division, has also retired after more than 42 years of service.

C. E. Weller, assistant supervisor of track on the Illinois Central, at Carbondale, Ill., has been appointed supervisor of track at DuQuoin, Ill., succeeding **M. J. Hawkins**, assigned to other duties at his own request, on account of ill health.

James T. Deason, whose promotion to track supervisor on the Central of Georgia, with headquarters at Columbus, Ga., was reported in the January issue, was born at Goodwater, Ala., on November 18, 1904, and entered railway service on May 10, 1922, as a section laborer on the Central of Georgia, at Goodwater. On April 15, 1923, he was advanced to apprentice foreman, and on June 24, 1924, he was promoted to section foreman at Calcis, Ala., later being transferred to Camp Hill, Ala. Mr. Deason was advanced to extra-gang foreman on July 1, 1940, which position he held until his recent promotion.

Hal Branham Orr, whose promotion to supervisor of track on the Chesapeake & Ohio, at Pikeville, Ky., was reported in the February issue, was born at Muncie, Ind., on June 10, 1914, and was graduated in civil engineering from Purdue University in 1936. He entered railway service on May 1, 1936, as a rodman on the Wabash, and a few weeks later went with the C. & O. as a chainman, later being advanced to rodman. In April, 1939, Mr. Orr was appointed a draftsman at Richmond, Va., and two years later was promoted to assistant cost engineer at Chillicothe, Ohio, later being transferred to Covington, Ky. On March 15, 1945, he was promoted to assistant supervisor of track at Chillicothe, which position he held until his recent promotion, effective January 1.

Henry J. Gagnon, whose appointment as roadmaster on the Quebec Central, with headquarters at Sherbrooke, Que., was reported in the February issue, was born at Lac Megantic, Que., on October 6, 1903, and studied correspondence courses, including a course on general track work. He entered railway service in January, 1918, as a sectionman on the Canadian Pacific, at Lowelltown, Me., and was promoted to relief section foreman in 1924. Mr. Gagnon became a permanently-assigned section foreman at Hardy Pond, Me., in 1930 and was advanced to extra gang foreman in 1940. On December 18, 1944, he was promoted to assistant roadmaster, with headquarters at Brownsville Junction, Me., which position he held until his recent appointment.

H. P. Morgan, whose promotion to supervisor of track on the Pennsylvania, at Shire Oaks, Pa., was reported in the

February issue, was born at Uniontown, Pa., on January 10, 1914, and was graduated in civil engineering from West Virginia University in 1936. Mr. Morgan entered railway service on the Pennsylvania on June 1, 1936, as an engineering apprentice at Oil City, Pa., later serving as an assistant on the engineering corps at Oil City, Johnston, Pa., Alliance, Ohio, and Dunkirk, N.Y., and in the office of the chief engineer maintenance of way at Pittsburgh, Pa. In June, 1940, he was advanced to assistant supervisor of track at Baltimore, Md. and in March, 1941, he was furloughed for military service. Upon his return, Mr. Morgan was appointed supervisor of track at Shire Oaks.

Crawford F. Grigg, whose appointment as supervisor of track on the Pennsylvania, at Cleveland, Ohio, was reported in the February issue, was born at Richmond, Va., on March 14, 1915, and was graduated in civil engineering from Virginia Military Institute in 1937. Mr. Grigg entered railway service in June of that year as an engineering apprentice on the Pennsylvania, at Wilkes-Barre, Pa., and later served as an assistant on the engineer corps at Columbia, Pa., Enola, and Baltimore, Md. In April, 1941, he was advanced to assistant supervisor of track at York, Pa., being transferred later in that year to Wilmington, Del. In April, 1942, Mr. Grigg was granted a furlough to enter military service with the 730th Railway Operating Battalion. Upon his return from military service, he was appointed supervisor of track on the Pennsylvania at Cleveland.

Bridge and Building

Alfred Brown has been appointed general foreman, bridge and building and water service, on the Atchison, Topeka & Santa Fe, with headquarters at Wellington, Kan., succeeding **J. O. Butler**, who has retired after more than 40 years of service.

G. P. Hayes, formerly acting master carpenter of the Philadelphia Terminal division of the Pennsylvania, who has recently returned from military service, has been appointed master carpenter of the Eastern division, with headquarters at Canton, Ohio, succeeding **J. C. Loughry**, who has been granted a leave of absence because of illness.

Special

Vaughn W. Oswalt, supervisor of work equipment of the Western lines of the Southern, with headquarters at Cincinnati, Ohio, has been promoted to assistant superintendent of scales and work equipment of the system, with headquarters at Washington, D.C. Mr. Oswalt was born at Wabash, Ind., on January 7, 1898, and worked for the Service Motor Truck Company at Wabash both preceding and after service in World War I. In 1921 Mr. Oswalt went with the J. G. Brill Company, Philadelphia, Pa., as a supervisor, and while with this company took a course in the maintenance and construction of internal combustion engines.

In 1934 he went with Sperry Products, Inc., Hoboken, N.J., as a service engineer, and on April 13, 1942, he entered the service of the Southern as supervisor of work equipment of the Western lines.

Obituary

H. C. Webb, who retired in 1937 as roadmaster on the Denver & Rio Grande Western, died on February 27, at Sarasota, Fla.

Cecil Ewart, who retired in 1938 as division engineer on the Canadian National, died at Victoria, B.C., on February 14.

J. B. Hunley, consulting engineer on the New York Central, Lines West of Buffalo, with headquarters at Chicago, died in a hospital in that city on March 2.

Charles C. Kirby, who retired in 1940 as district engineer of the Canadian Pacific, with headquarters at Saint John, N.B., died on January 24. Mr. Kirby was born on March 8, 1880, at Newport, England.

Lewis M. Duclos, division engineer on the Canadian Pacific at Woodstock, N.B., died recently. Mr. Duclos was born on June 22, 1890, and entered railway service as a chainman on the Canadian Pacific at Ottawa, Ont., later serving as a rodman and transitman at Ottawa, Kentville, N.S., and Smith Falls, Ont. In 1931 he was promoted to assistant division engineer at Smith Falls, and in 1938 was advanced to division engineer at Sudbury, Ont., later being transferred to Woodstock.

Reginald Mudge, who retired on December 31, 1943, as assistant engineer of track of the Canadian Pacific, with headquarters at Montreal, Que., died in that city on February 10, after a long illness. Mr. Mudge was born May 1, 1885, at Montreal, and was educated at McGill University, graduating in engineering in 1906. On August 15, 1907, he entered the service of the Canadian Pacific, and was engaged for five years on the location and construction of new lines and on double-tracking projects. From 1912 to 1914, he served as assistant engineer at Montreal, and during the war he saw active service overseas as a railway construction engineer with the rank of captain. Following the war, Mr. Mudge returned to the Canadian Pacific as assistant engineer on railway location and construction. In 1925 he was assigned to the general office, where he was engaged on valuation work and in the design of yards and terminals, and in 1938 he was promoted to assistant engineer of track at Montreal.

Roy D. Garner, who retired on March 8 as general manager and chief engineer of the Central Vermont (part of the Canadian National system), with headquarters at St. Albans, Vt., died on March 9. Mr. Garner was born at Waverly, Iowa, on January 15, 1885, and attended Wartburg academy and Iowa State College. He entered railway service as a chainman on the Chicago Great Western during summer vacations in 1902 and 1903, becoming a transitman and resident engineer for the Minneapolis, St. Paul & Sault Ste. Marie in 1904. The

following year he went with the Minneapolis & St. Louis, serving as a transitman and resident engineer, and in 1907 he became an assistant engineer on the Grand Trunk (now part of the Canadian National), at Buffalo, N.Y. Mr. Garner was appointed engineer of the Southern New England (a subsidiary of the Central Vermont) in 1913, and was advanced to chief engineer of the Central Vermont in May, 1930. In 1944 he was also appointed general manager.

B. R. Kulp, chief engineer of the Chicago & North Western, at Chicago, died at his home in Evanston, Ill., on February 27. Mr. Kulp was born at Duncannon, Pa., on December 16, 1883, and was gradu-



B. R. Kulp

ated from Rensselaer Polytechnic Institute in 1905. He obtained his first railroad experience as an instrumentman on the Galena division of the North Western. Later he was advanced to draftsman and to assistant engineer of maintenance on that division, and in 1909 he was transferred to terminal improvement work at Clinton, Iowa. During 1910 and 1911 he served as assistant engineer on yard improvements at Proviso, Ill., and in 1912 he was promoted to division engineer of the Ashland division at Antigo, Wis. Mr. Kulp was appointed trainmaster on the Southern Illinois division at Benld, Ill., in 1917, where he remained until 1918, when he was transferred to the Galena division at Chicago. In 1920 he returned to the engineering department as division engineer of the Madison division, where he remained until May 1, 1931, when he was promoted to principal assistant engineer. Mr. Kulp was further advanced to engineer maintenance, with headquarters at Chicago, on January 1, 1936, and in April, 1940, he was promoted to the position he held at the time of his death.

Bradley Washfountains—An attractive 12-page two-color booklet has been issued by the Bradley Washfountain Company, Milwaukee, Wis., entitled "Washroom Layouts From Bradley Files." Designed to aid those persons planning new washrooms or intending to modernize old ones, the booklet contains a number of blueprint layout reproductions of Bradley Washfountains and multi-stall showers.

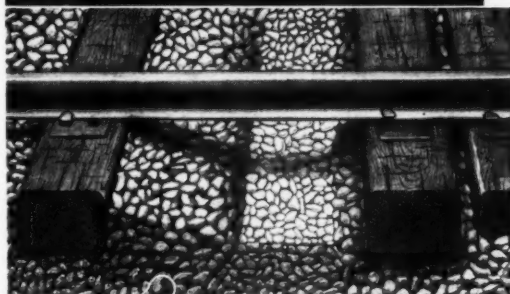
(Continued on page 452)

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Association News

Railway Tie Association

The association will hold its twenty-eighth annual convention in the Netherlands Plaza Hotel, Cincinnati, Ohio, May 28-29.

Metropolitan Maintenance of Way Club

The next meeting of the club will be the annual meeting, to be held at the Hotel Sheraton, New York, on April 25. The program committee has plans for an interesting meeting, but arrangements have not yet been completed.

Roadmasters' Association

The Executive committee of the association met in Chicago on March 11 to transact routine business and to further plans for the annual meeting of the association in Chicago, September 17-19, to be held in conjunction with the annual meeting of the American Railway Bridge and Building Association and a joint exhibit of the Track Supply Association and the Bridge and Building Supply Men's Association. The next meeting of the Executive committee has been scheduled for July 15, to review preliminary drafts of the six technical reports to be presented at the annual meeting and to complete other plans for the meeting.

Maintenance of Way Club of Chicago

The March meeting of the club, with 231 members and guests in attendance, was held on March 25 in the Ambassador Room of Huyler's Restaurant, Chicago, the feature of the meeting being an address by G. M. O'Rourke, assistant engineer maintenance of way, Illinois Central System, who spoke on How the Illinois Central Has Cut Personal Injuries and Motor Car Accidents.

The next meeting of the club, to be held on April 22, will be the annual meeting, with election of officers, and will be preceded by an informal reception beginning at 6:00 p. m. The speaker at this meeting will be J. P. Kiley, assistant general manager, C. M. St. P. & P., who will discuss What Management Expects of the Maintenance of Way Department.

Track Supply Association; B. & B. Supply Association

The directors of these two associations met jointly in Chicago on March 25 to discuss their common interests in the joint exhibit being planned by the associations in the Hotel Stevens, Chicago, September 17-19, concurrent with the annual conventions of the Roadmasters' Association and the American Railway Bridge and Building Association.

In anticipation of a capacity exhibit, which some believe may overflow the large exhibit hall of the hotel, Lewis Thomas, secretary of the Track Supply Association, has been appointed Director of Exhibits

for the coming show, and should be addressed relative to exhibit plans and space reservations at 59 East Van Buren St., Chicago. Application forms for exhibitors are now being prepared and will be available within the next two or three weeks.

Bridge and Building Association

With the work of all of its eight technical committees under way, and the many other activities of the association progressing favorably, looking to the annual meeting of the association on September 17-19, in Chicago, concurrent with the annual meeting of the Roadmasters' Association, the usual Executive committee meeting scheduled in April has been cancelled. In its stead a full one-day and possibly two-day Executive committee meeting will be held early in July. At this meeting, all of the technical reports now being prepared for presentation at the annual meeting will be reviewed and plans for the annual meeting will be progressed still further.

Wood-Preservers' Association

The forty-second annual meeting of the association, a full-scale meeting in every respect, will be held at the Netherlands Plaza Hotel, Cincinnati, Ohio, on April 23-25.

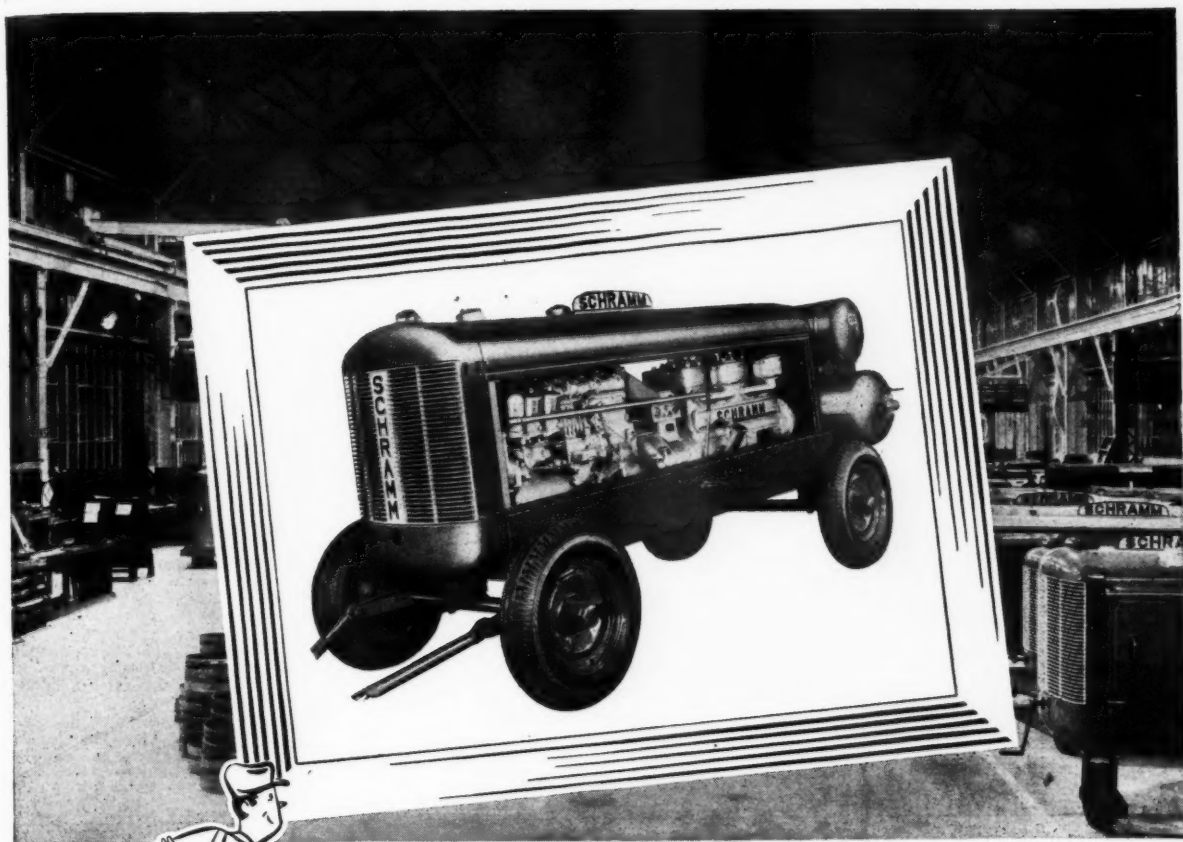
Final programs for this meeting have not been sent to members as yet, but four intensive sessions are scheduled, which include the morning and afternoon of April 23, and the mornings of April 24 and 25. A feature of the meeting will be the Users' Day program scheduled for the morning of the 24th, which will include papers and addresses of particular interest to railway men, among which will be an address by J. B. Akers, chief engineer, Southern Railway System, on The Need for Research and Development in the Wood Preserving Industry. The opening session of the meeting on April 23 will be addressed by S. O. Dunn, editor of Railway Age and chairman of the board of Simmons-Boardman Publishing Corporation, on Economic Conditions and Problems Facing Business and Industry.

Special arrangements have been set up by the Transportation committee of the association looking to special sleeping car accommodations to and from the annual meeting from New York, New Orleans, Houston, St. Louis, Chicago, Portland, Seattle and Spokane, and it is expected that information concerning these arrangements, and complete programs for the annual meeting, will be in the hands of all members during the first week in April.

American Railway Engineering Association

At the annual meeting of the association at Chicago on March 12-14, with 1,337 members and guests in attendance, it was announced that the following officers had been elected to serve during the ensuing year: President, J. B. Akers, chief engineer, Southern, Washington, D. C.; vice-president to serve two years, Armstrong Chinn, executive officer, Alton, Chicago; directors: C. H. Blackman, chief engineer,

(Continued on page 454)



IN AIR COMPRESSORS...THERE ARE

Masterpieces, too

Specialized workers make Schramm Air Compressors with that all-important "Know-How". So, when you get your Schramm Air Compressor you know you are not only getting a compressor with many exclusive features, but you know Schramm workers are assembling the features right, testing them thoroughly, and making a Masterpiece!

Schramm, with its enlarged facilities and modern plant at West Chester, produces on a large scale for industry. Schramm's expert workers and larger, modern facilities are geared to meet your needs for Air Compressors, both portable and stationary, in a wide range of sizes, for any requirements.

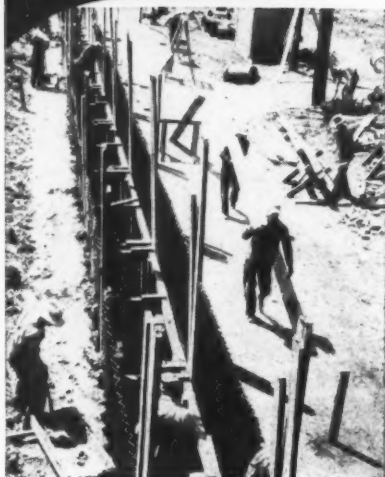
Today's features of Schramm Compressors are those that have stood up so well under the test of actual performance. These features include (1) 100% watercooled (2) mechanical intake valve (3) forced feed lubrication (4) push-button starting (5) compact and lightweight.

Post-war industry will find many uses for the versatile Schramm Air Compressor. We invite you to write today for our new catalog and become acquainted with the construction features and details of the many Schramm models.

SCHRAMM INC.

**THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA**

for SPEED ...Specify STEEL Sheeting



Sheeting jobs, whether permanent or temporary, are done quickly and economically with ARMCO Steel Sheeting. Check these advantages in railroad construction:

SAFE STRENGTH ... ARMCO Sheeting is corrugated to assure ample strength with light weight. It makes for easy handling and quick installation.

EASY TO DRIVE ... Light weight and small displacement area simplify driving. Sections butt together or are held securely in place by continuous interlocking joints that assure the right alignment and practical water-tightness.

LOW COST ... Besides economy of installation, ARMCO Sheeting is low in first cost. You buy the exact weight you need. Repeated use of the sheeting makes average job costs surprisingly low.

ARMCO Sheeting is nestable and requires little space for shipment and storage. Write us for prices and detailed information on how ARMCO Steel Sheeting can fit your needs. Armco Drainage & Metal Products, Inc. and Associated Companies, 1735 Curtis Street, Middletown, Ohio.



Armco Sheeting

Louisville & Nashville, Louisville, Ky.; S. E. Armstrong, engineer maintenance of way, New York Central System, New York; and J. S. McBride, chief engineer, C. & E. I., Chicago. C. J. Geyer, general manager, Chesapeake & Ohio, Richmond, Va., and vice-president of the association, was advanced automatically to senior vice-president, succeeding Mr. Akers.

The Committees on Outline of Work and Personnel have completed the makeup of committees and assignments of subjects for the ensuing year, and a booklet containing the assignments and personnel of committees will be mailed to all members about April 1. Because the decision of the Board of Direction establishing a definite rule limiting the tenure of chairman and vice-chairman of committees to three years each, the reorganization of the committees that has just been completed has included the most extensive turnover in committee chairmen in the history of the association. In fact, 14 of the committees are beginning their work for the coming year with new chairmen. In the case of four committees, because of special circumstances, it was necessary to provide chairmen who had not previously served as vice-chairmen. In the following is given the list of the committees, together with the names of the chairmen, as well as the new subjects that have been assigned to each committee. Among the chairmen, those designated by asterisks have been newly appointed.

Roadway and Ballast—W. C. Swartout, asst. engr., M.P., St. Louis, Mo., chairman. New subjects—Describe installations where head walls, wingwalls, inverts and aprons are required; prepare specifications therefor; chemical elimination of grass and weeds; importance of periodical fence inspection.

Ties—C. D. Turley,* engr. of ties and treatment, I.C., Chicago, chairman.

Rail—C. B. Bronson,* insp. engr., N.Y.C., New York, chairman.

Track—J. H. Schram, ch. engr. m. of w., Erie, Cleveland, Ohio, chairman. New subjects—Maximum speed through spring switches when points must be thrown by train moving on tangent track, collaborating with Signal section, A.A.R.; hold-down fastenings for tie plates; design, use and economy with respect to minimizing tie wear, collaborating with Committee 3.

Buildings—H. C. Lorenz, asst. engr., C.C.C. & St. L., Cincinnati, Ohio, chairman. New subjects—Servicing facilities for Diesel locomotives; use of recently developed building materials in railway buildings; ventilation of railway shop buildings, particularly for Diesel locomotives; pile foundations for railway buildings.

Wood Bridges and Trestles—S. F. Grear, asst. engr. of br., I.C., Chicago, chairman.

Masonry—F. R. Smith,* asst. ch. engr. in chg. of b. & b., Union R.R., East Pittsburgh, Pa., chairman. New subject—Earth pressures as related to masonry structures.

Highways—A. P. Button, asst. to ch. engr., N.Y.C., Chicago, chairman. New subject—Plan of barrier for dead-end streets.

Records and Accounts—F. B. Baldwin,* val. engr. sys., A.T. & S.F., Chicago, chairman. New subjects—Office and drafting practices (a) organization, duties and nature of assignments, (b) modern mechanical drafting aids; study of statistics for railway maintenance, operation and construction; construction reports and property records; their relation to current problems.

Water Service and Sanitation—E. M. Grime,* engr. w.s., N.P., St. Paul, Minn., chairman. New subjects—Relative effectiveness of cathodic protection and painting in preventing corrosion of the interior of steel tanks; plastic pipe fittings for small water lines, conveying of chemical solutions, etc.; new developments in water conditioning for Diesel locomotive radiators and flash boilers.

Yards and Terminals—G. F. Hand,* gen. asst. engr., N.Y.N.H. & H., New Haven, Conn., chair-

man. New subjects—Locomotive terminal facilities; communication systems in yards and terminals.

Iron and Steel Structures—E. S. Birkenwald,* engr. br., Southern Cincinnati, Ohio, chairman.

Economics of Railway Location and Operation—F. N. Nye,* engr. econ., N.Y.C., New York, chairman.

Wood Preservation—C. S. Burt,* mgr., For. Prod., Bur., I.C., Memphis, Tenn., chairman. New subject—Preliminary conditioning of forest products for treatment by artificial methods of seasoning.

Uniform General Contract Forms—W. R. Swatosh,* asst. engr., Erie, Cleveland, Ohio, chairman. New subject—Form of construction contract for minor projects.

Economics of Railway Labor—J. S. McBride,* ch. engr., C. & E. I., Chicago, chairman. New subject—Labor economies to be derived by adherence to safety precautions.

Co-operative Relations With Universities—F. R. Layng, ch. engr., B. & L.E., Greenville, Pa., chairman.

Waterways and Harbors—Benjamin Elkind, off. engr., Erie, Cleveland, Ohio, chairman. New subjects—Recommended minimum clearances on inland waterways, particularly on large canals; study different methods of constructing closures in flood control levees crossing railroads.

Maintenance of Way Work Equipment—Edgar Bennett,* ch. engr. m. of w. and s., Southern, Knoxville, Tenn., chairman. New subjects—Portable conveyors; snow removal equipment; concrete handling equipment; power jacks; machinery and equipment for stabilizing roadbed.

Clearances—J. E. South,* asst. engr. of br., Penna., Philadelphia, Pa., chairman.

Waterproofing—G. E. Robinson,* engr. of str., N.Y.C., Chicago, chairman.

Impact and Bridge Stresses—C. H. Sandberg, asst. br. engr. sys., A.T. & S.F., Chicago, chairman. New subject—Tests of steel truss spans with open and ballasted decks, particular attention to be given to the damping due to the type of deck and the track ballast.

President Akers has called a meeting of all committee chairmen to be held at the association headquarters in Chicago on April 16. Committees that have scheduled meetings to be held during April include the Committee on Water Service and Sanitation, which will meet in Chicago on April 17, and the Committee on Economics of Railway Labor, which will meet at Chicago on April 25.

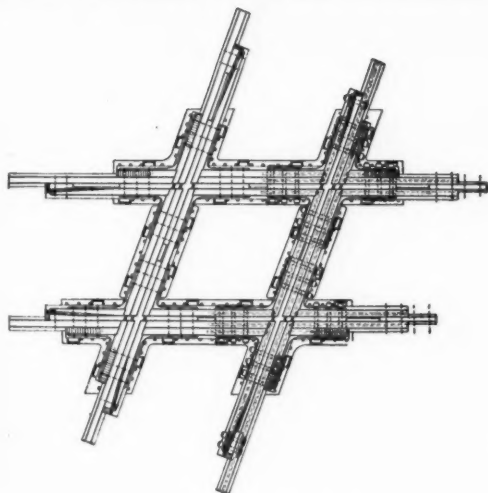
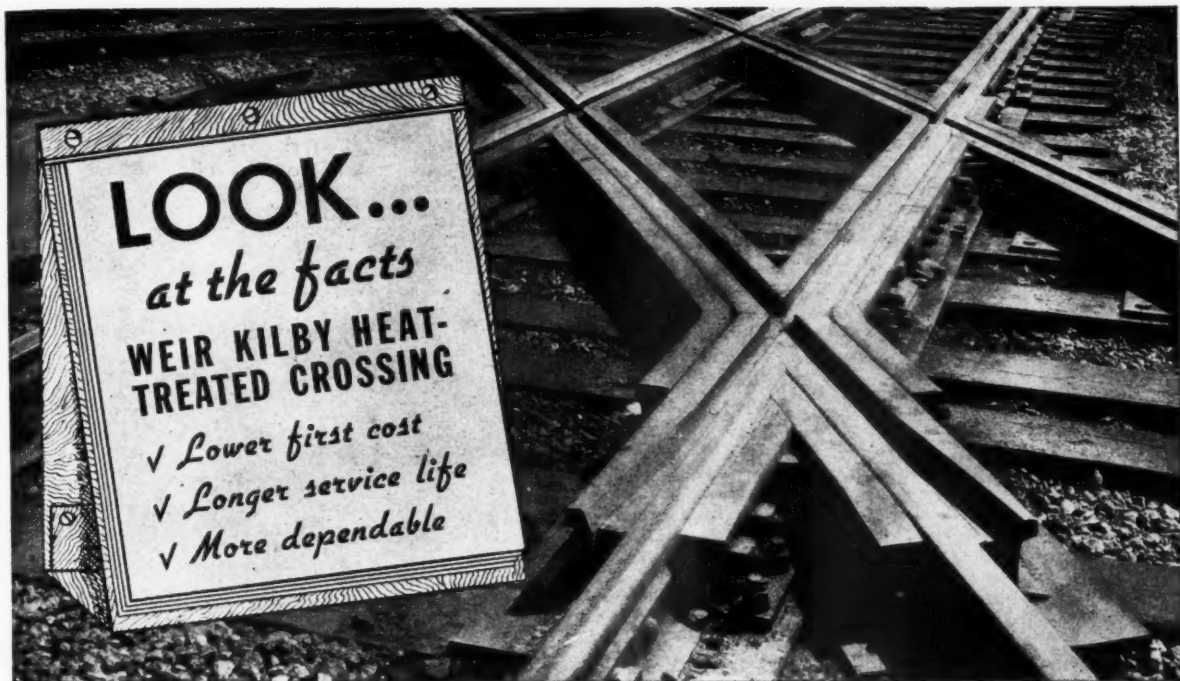
Supply Trade News

General

R. G. LeTourneau, Inc., Peoria, Ill., has announced the appointment of three more distributors under its new railroad sales and service program. The distributors are Fuchs-Clayton Machinery Co., Omaha, Neb., Rozier-Ryan Co., St. Louis, Mo., and the Furnival Machinery Co., Philadelphia, Pa., each of which becomes the authorized general Le Tourneau distributor in its respective territory.

The Flinkote Company has announced the construction of a new research laboratory at Morristown, N.J., at a cost of approximately one million dollars for plant and equipment. The new laboratory is part of an accelerated program of product research and development, and plant expansion and modernization, representing a contemplated outlay of about ten million dollars of which approximately six million dollars were authorized prior to December 31, 1945.

(Continued on page 456)



CATALOG "H"



Comprises 154 pages of helpful data, replete with photos, drawings and specifications, covers every track work need. A request on your letterhead will bring your copy promptly.

LOOK... at the facts of the WEIR KILBY New, HEAT-TREATED RAIL CROSSING when you have new or replacement requirements. YOU are vitally concerned with the three critical elements in every crossing installation.

- ✓ **LOWER FIRST COST**... Weir Kilby Heat-Treated Crossings are more economical when compared with other heavy duty types.
- ✓ **LONGER SERVICE LIFE**... Because of proven durability of Heat-Treated Steel. Our method consists of fabricating and completely assembling all the parts in carbon steel rail; after all adjustments have been made to insure proper fit of all the parts, the crossing is taken apart and then heat-treated.
- ✓ **MORE DEPENDABLE**... Each rail is individually heat-treated and tested before final assembly. This method of constructing Weir Kilby Heat-Treated Crossings has proven its value consistently in giving more dependable performance... longer service life and lower first cost.

Try the New WEIR KILBY HEAT-TREATED CROSSINGS for your next requirement—where the going is toughest.

Standard and Special Track Work for Steam Railroads Since 1882

WEIR KILBY CORPORATION


CINCINNATI 12, OHIO

BIRMINGHAM 7, ALA.

Successors to

WEIR FROG CO. . . . KILBY FROG & SWITCH CO. . . . CINCINNATI FROG & SWITCH CO.

Now Available
PORTABLE
Sanitary
DRINKING
FOUNTAIN



**CLEAN,
COOL WATER
FOR
CONSTRUCTION
AND
MAINTENANCE
CREWS**

BANISH GERM SPREADING PRACTICES!

Eliminate the use of unsanitary pails, kegs, dippers or cups, and protect the health and strength of your workmen on jobs where *fresh, clean and cool* drinking water is not permanently available. . . . Save payroll losses by keeping your men on the job! The Dobbins Portable Drinking Fountain does all this by providing protection from disease, colds, etc., which may otherwise be spread with the use of a "common" drinking cup or dipper. Inner water container and bubbler parts made of corrosion-proof stainless steel or plated brass. Fully insulated to keep water *fresh and cool*. Four gallon capacity. A few strokes with the pump supplies compressed air for instant flow of water at the press of a button. Fountain equipped with large, comfortable carrying handle; mounting bracket for salt tablet dispenser; loops for carrying strap. Meets requirements of Public Health Authorities!

ORDER DIRECT FROM FACTORY IMMEDIATE DELIVERY

No. 18—Dobbins Superbilt Portable Drinking Fountain, lens carrying strap and salt dispenser, **Only \$12.50**
 Salt Tablet Dispenser, 500 tablet capacity, extra **\$2.75**
 Adjustable, Waterproof Carrying Strap, extra **\$1.00**
 Spill Cup, to catch overflow when used indoors . . . **\$3.50**
 All prices F. O. B. Elkhart, Indiana. Illustrated circular will be mailed on request.

DOBBINS MANUFACTURING COMPANY
 Dept. 420, Elkhart, Indiana

Dobbins
Superbilt
 PORTABLE DRINKING FOUNTAIN

Personal

John J. Gillis, manufacturers' agent, has been appointed representative in the New England area for the Warren Tool Corporation of Warren, Ohio.

George H. Curran, formerly assistant treasurer of the Wood Preserving division of Koppers Company, Inc., has been elected treasurer of D. B. Frampton & Co., Pittsburgh, Pa., and its subsidiary, the Baker Wood Preserving Company, Marion, Ohio.

E. S. McCormick, recently released from the armed forces, has returned to the American Hoist & Derrick Company, St. Paul, Minn., as district representative, with headquarters at 111 West Washington St., Chicago.

Arthur J. Olson, district sales engineer for the Link-Belt Company, at Chicago, has been appointed district sales manager at Kansas City, Mo., to succeed Max Giffey, who has resigned after 40 years of service.

E. R. Galvin, formerly president of the Tyson Bearing Corporation of Massillon, Ohio, has been elected executive vice-president, general sales manager, and member of the board of directors of the LaPlant Choate Manufacturing Co. of Cedar Rapids, Iowa.

Robert L. Nutt has been appointed sales representative of the Rust-Oleum Corporation, Evanston, Ill., with headquarters in the National Bank of Commerce Building, Norfolk, Va., where he will cover the railways along the Atlantic seaboard.

Paul V. Miles, formerly assistant sales manager, railroad and illuminating department, of the Corning Glass Works, has been appointed western manager of the Justrite Manufacturing Company of Chicago. Mr. Miles is located in San Francisco, Cal.

P. J. Patton, Jr., has been appointed regional manager of the industrial division of the Ransome Machinery Company, Dunellen, N.J., a subsidiary of the Worthington Pump and Machinery Corporation, with headquarters at 400 West Madison St., Chicago.

Kenneth F. Park, sales development manager of the Caterpillar Tractor Company, has been promoted to engineering consultant on all matters pertaining to the earth-moving field, a newly-created position. In his new capacity Mr. Parks will serve the three sales divisions of the company which cover the entire United States and Canada.

F. B. Hornibrook has been appointed assistant director of research of the Master Builders Company, Cleveland, Ohio. On the staff of the National Bureau of Standards since 1930, Mr. Hornibrook has served as assistant to section chief of the cement and concreting materials section for the past five years.

F. H. Kilberry has been elected executive vice-president and director of the Nordberg Manufacturing Company, Milwaukee, Wis., succeeding C. E. Stryker,

who has resigned to become president of the Adel Precision Products Corporation, Burbank, Cal. Mr. Kilberry has been associated with the Nordberg Manufacturing Company since May, 1945, when he resigned as president of the Atlas Imperial Diesel Engine Company, Oakland, Cal.

Frank J. Meyer, whose appointment as chief engineer, railroad division, of the Philadelphia Steel & Wire Co., Philadelphia, Pa., was reported in the February issue, began his career as rodman for the Rapid Transit Subway Construction Company in the East river terminals, New



Frank J. Meyer

York. He entered railway service in February, 1906, in the engineering department of the New York, Ontario & Western, serving successively as chairman, rodman, levelman, transitman, chief of party, supervisor of tracks, roadmaster, engineer in charge of bridges, buildings, tunnels, docks, anthracite and bituminous coal storage, tie and timber inspection, grade crossing eliminations, and general roadmaster. He was appointed assistant chief engineer and later chief engineer of the railroad in 1942.

C. L. Richard has been appointed special representative of the scale division of Fairbanks, Morse & Co., with headquarters at Chicago. Mr. Richard was a member of the National Bureau of Standards staff for 19 years. During the past three years he has served the ordnance bureau of the U. S. War Department as advisor and consultant on problems of gaging and weighing in the ammunition production industry.

The Forest Industries Blaze New Trails
 —A 36-page booklet published by the Timber Engineering Company, Washington, D.C., which gives the history of man's use of wood, and also describes the recent technological developments of wood as an engineering medium. Printed in five colors, the booklet illustrates such diverse wood research projects and developments as plastics from impregnated sawdust, chemical bending and seasoning of wood, molded products, the production of ethyl alcohol and other chemicals from so-called "waste" wood, dowels for furniture, and tests of flat timber trusses under long-time loading.

Get Those Spikes Out Faster



Rail laying is not delayed at bridges, trestles and switches. Spikes difficult to pull by hand can easily be pulled with the spike puller.

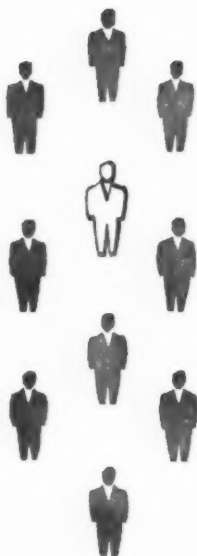
Getting spikes out faster speeds up rail laying. In addition to doing the work faster, machine pulling reduces the cost of this operation and saves labor too. This is important in these days of maintenance labor shortage. With most roads, hand pulling has been made obsolete by mechanizing the spike pulling job. If you are not using Nordberg Spike Pullers on your jobs, investigate the advantages of this and other power maintenance tools built by Nordberg.

PUT THESE TOOLS TO WORK ON YOUR MAINTENANCE JOBS

- Spike Puller
- Adzing Machine
- Power Wrench
- Rail Drill
- Spike Hammer
- Surface Grinder
- Utility Grinder
- Flexible Arm Grinder
- Midget Grinder
- Power Jack
- Track Shifter



NORDBERG MFG. CO. MILWAUKEE WISCONSIN
Export Representative—WONHAM Inc.—44 Whitehall St., New York



9 OUT OF 10

want

THE PAYROLL SAVINGS PLAN
CONTINUED!

Thanks to the cooperation and encouragement of America's industrial executives, 85 million bond holders have bought U.S. Bonds in the greatest savings program in history. Employees who have purchased billions of dollars of these bonds during the war now want to continue monthly purchases of savings bonds. Specific evidence of this desire to continue saving for personal security and prosperity through the Payroll Savings Plan was recently revealed by a survey which disclosed that 90% wanted the Plan continued.

Every employer can write in his own set of reasons why the Payroll Savings Plan should be continued as a part of his personnel relations program, but the principal advantages are obvious:



A large reservoir of national savings; a strong and stable bulwark against inflation.

An "automatic" thrift habit for the worker; to increase contentment and satisfaction in his job.



An opportunity for the employee to maintain his "share in America" with the safest, easiest, most profitable investment he can make.

An opportunity for the returned veteran to share in the Payroll Plan's varied benefits.



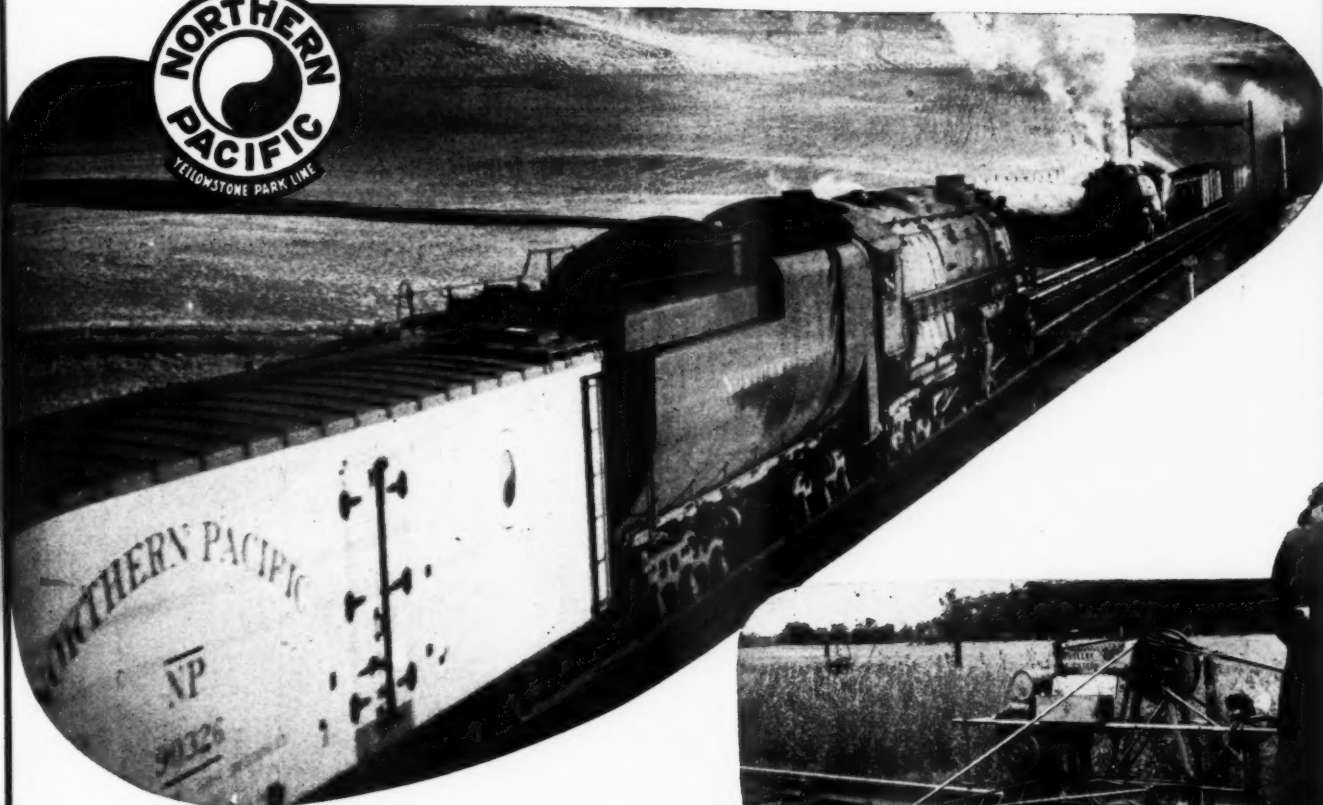
Your employees will require little "selling" on the idea—they are accustomed to their monthly saving habit. With the Treasury Department's savings bond program now in peacetime operation, your partnership is again invited to continue this systematic, convenient means of contribution to a prosperous peacetime future.

The Treasury Department acknowledges with appreciation the publication of this message by

Railway Engineering and Maintenance

This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and Advertising Council

The "Main Street of the Northwest"



uses WOOLERY TIE CUTTERS for faster tie renewals . . .

As powerful Northern Pacific locomotives help keep traffic on schedule along the "Main Street of the Northwest", so do modern efficient WOOLERY TIE CUTTERS assist in keeping their tie renewal program up-to-date at a minimum of cost.

With the Woolery Tie Cutter, two cuts are made in the tie just inside the rail with about 20 to 30 seconds required for each cut. The end sections of the tie are easily pried out with a bar, while the center section is removed by lifting out from between the rails. This results in practically no disturbance to the tie bed.

The blade of the Woolery Tie Cutter operates with a reciprocating motion and can make from 50 to 100 cuts before sharpening is necessary.

Since tie replacement time, labor and cost are reduced greatly with Woolery Tie Cutters, railroads are using hundreds of them and saving up to 30% in tie renewal charges.



WOOLERY MAINTENANCE EQUIPMENT
Tie Cutters Creosote Sprayers
Weed Burners
5-burner, 3-burner, 2-burner
and 1-burner models available

WOOLERY MACHINE COMPANY
MINNEAPOLIS Pioneer Manufacturers of MINNESOTA



RAILWAY MAINTENANCE EQUIPMENT

RAILWAY WEED BURNERS • MOTOR CARS • TIE CUTTERS • TIE SCORING
MACHINES • RAIL JOINT OILERS • CREOSOTE SPRAYERS • BOLT TIGHTENERS



Creosoted

**PIILING
POLES
TIMBERS
TIES**

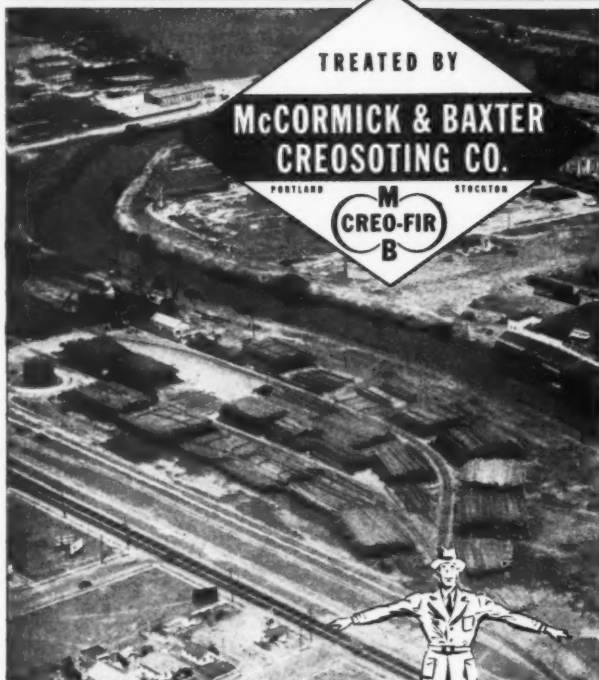
TREATED BY

**McCORMICK & BAXTER
CREOSOTING CO.**

PORTLAND



STOCKTON



88 acres
FOR PROPER SEASONING
AND STORAGE...



McCormick & Baxter facilities are adjacent to the Douglas Fir region. Deep water dockage, rail sidings and our own timber assure prompt deliveries by water, rail or truck. Call on us for figures next time... you'll like our way of *delivering!*

**McCORMICK & BAXTER
CREOSOTING CO.**

OFFICES:

BOARD OF TRADE BLDG., PORTLAND, OREGON
485 CALIFORNIA ST., SAN FRANCISCO, CALIF.

TREATING PLANTS:

STOCKTON, CALIFORNIA • PORTLAND, OREGON

This is the Portable
SAW that CUTS

8 x 16's *Quick!*



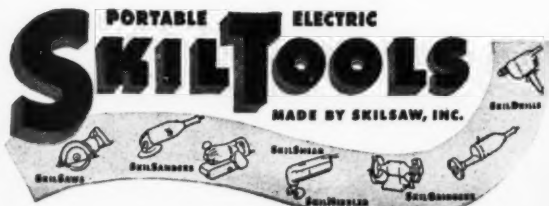
12 IN. ELECTRIC or PNEUMATIC
SKILSAW!

● Either model cuts 4 $\frac{3}{8}$ in. deep, rips or crosscuts 8-inch timbers in two quick cuts. Electric SKILSAW operates from power lines or portable generators on voltages up to 250 v. Pneumatic SKILSAW operates at maximum horsepower on 75 cu. ft. of free air under 80 to 100 lb. air pressure. Both SKILSAWS go right to the job, save time, labor, material handling... step up the output of your construction gangs. Ask your distributor today for a demonstration.

SKILSAW, INC.

5033-43 Elston Ave., Chicago 30, Ill.

Factory Branches in All Principal Cities



HOW TO DO SPRING PAINTING

FOR ONLY

65¢ a gal.*

This spring you can get all the paint you need to do those paint jobs put off because of war-time paint restrictions. Furthermore, you can get it at the low cost of only 65¢ per gallon* in types suitable for interiors or exteriors. For example, look at the two types offered for sale in this advertisement. Both are surplus government-owned paints available in enormous quantities and many locations. Write, wire or phone your nearest War Assets Administration Office below or clip and mail the coupon.

*Minimum sale 200 gallons of any one color, F.O.B. location, subject to prior sale. Packaged in 5 gal. containers... some in 50 gal. drums.



EXTERIOR—Oil-Type Ready-Mixed Paint T-1215

This is a medium grade paint which is ready to use and inexpensive. It produces a flat finish when brushed or sprayed on the surface to be protected. It is suitable for the great bulk of exterior maintenance painting. T-1215 may be used also as a first coat or undercoat over previously painted surfaces. T-1215 may be mixed in with linseed oil-white lead or other oil paints to obtain lighter shades or higher gloss. It dries in a few hours. Suggested uses for wood surfaces include buildings, warehouses, fences, garages and barns. Paint may be used on primed tin and galvanized iron roofs and metal buildings; also on brick, masonry and concrete.

COLORS: Black—Dark Green—Loam (dark slate color)—Olive Drab—Field Drab (gray-brown color)—Earth Yellow (deep buff color)—Earth Brown (smoke brown color).

INTERIOR—Oleoresinous Emulsifiable Paint T-1279

This paint is best suited for interior use. It is an oil-in-water emulsion type widely used today. It is thinned for application with water or organic solvents, such as naphtha or mineral spirits. The paint is very easy to brush on and dries to a flat finish, easy to clean; also may be sprayed. Any two colors make an attractive contrasting finish. Dark colors used on lower part of walls hide soiling marks. T-1279 contains a fungicide for mildew prevention. It can be applied on cold, damp surfaces. T-1279 may be mixed in with white or light casein paints to produce lighter shades but not with conventional oil paints. Suggested uses include walls, and ceilings of plaster, composition board, concrete, stucco and brick; also concrete floors.

COLORS: Light Green—Dark Green—Field Drab (gray-brown color)—Earth Yellow (deep buff color)—Black—Earth Brown (smoke brown color)—Loam (dark slate color)—Sand—Olive Drab—Earth Red (Cinnamon color).

VETERANS OF WORLD WAR II

To help you in purchasing surplus property, a veterans' unit has been established in each War Assets Administration Regional Office.

To War Assets Administration:

Please send me, without obligation, information on the following:

Oil-Type Ready-Mixed Paint, T-1215;	Name.....	Tel No.....
colors.....	Firm.....	
Oleoresinous Emulsifiable Paint, T-1279	Address.....	
colors.....	City.....	State.....

444

WAR ASSETS ADMINISTRATION

OFFICES LISTED BELOW ARE TEMPORARILY IN
RECONSTRUCTION FINANCE CORPORATION AGENCIES

Offices located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver
Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville
Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia
Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane
Cincinnati • Fort Worth (Telephone 3-5381)

on the Job with
WISCONSIN
POWERED
Maintenance Equipment!

Typical of the many and varied railway maintenance operations that are now most advantageously handled by Wisconsin Engine-powered equipment, are those illustrated below. It is a noteworthy fact that these manufacturers specify "Wisconsin Heavy-Duty Air-Cooled Engines" as standard power for the operation of their equipment . . . a well-founded tribute to the extreme dependability, all-weather serviceability, economy, operating efficiency and adaptability of Wisconsin Air-Cooled Engines.

Spraying rail joints with Wisconsin-powered Fairmont W61 Series A Oil Spray Car, made by Fairmont Railway Motors, Inc., Fairmont, Minn.



Woolery Jr. Weed Burner, made by Woolery Machine Co., Minneapolis, Minn., engaged in clearing track of heavy weed growth.



Frog grinding with Model P-22 Portable Flexible Shaft Grinder, for steam railroad use, made by Railway Track Work Co., Philadelphia, Pa.



Tie tamping with Wisconsin-powered tamping outfit made by Electric Tamping & Equipment Co., Ludington, Mich.

Northwestern 540-DA double head type Rail and Frog Grinder, made by Northwestern Motor Co., Eau Claire, Wis., grinds either rail or both rails of frogs or cross-overs without turning machine around.



Wisconsin Heavy-Duty Air-Cooled Engines are supplied in a complete power range from 2 to 30 hp., in 4-cycle single cylinder and 4-cylinder types.

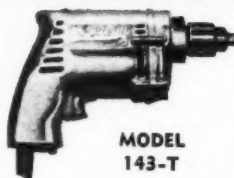
Most H.P. per pound
WISCONSIN MOTOR
 Corporation
 MILWAUKEE 14, WISCONSIN, U.S.A.
 World's Largest Builders of Heavy-Duty Air-Cooled Engines



**SIMPLIFY DRILLING
 IN CLOSE QUARTERS**

WITH A

Mall Drill
REG. U.S. PAT. OFF.



MODEL
 143-T

The compact design of the 1/4" MallDrill makes it easy to handle in close quarters and cramped positions . . . its perfect balance permits operation with either hand . . . and its light weight reduces the worker's fatigue when drilling in difficult positions.

Equally efficient on metal, wood or plastic, the Mall-Drill is designed for constant duty. Its powerful high speed motor is cool running and will not stall in hand drilling. Special steel alloy gears, and extra long brushes make for long service. The commutator is easily accessible for cleaning and inspection and the brushes can be replaced without dismantling the drill.

The 1/4" MallDrill is available in 2 speeds—Model 143-T 2500 r.p.m.—Model 143-TP 1700 r.p.m.

The 1/2" MallDrill is tailor-made for heavy duty drilling. It has a 1/2" capacity in metal and 1" capacity in wood. It is equipped with powerful ball-bearing motor, steel alloy helical gears and the finest chucks. Its streamlined appearance is designed for peak efficiency and service.

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RAILROAD DEPARTMENT

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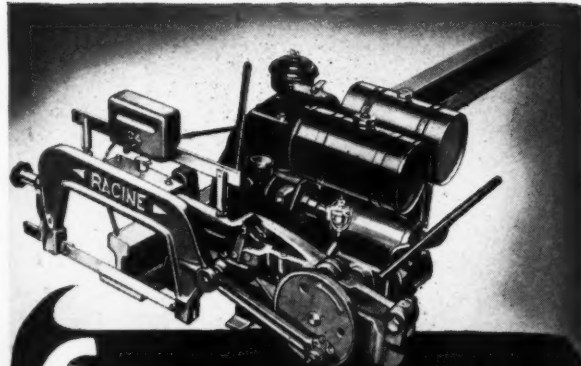
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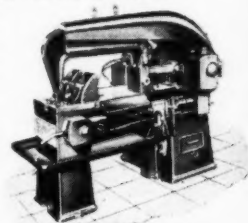
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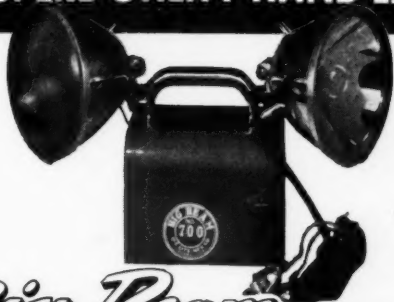
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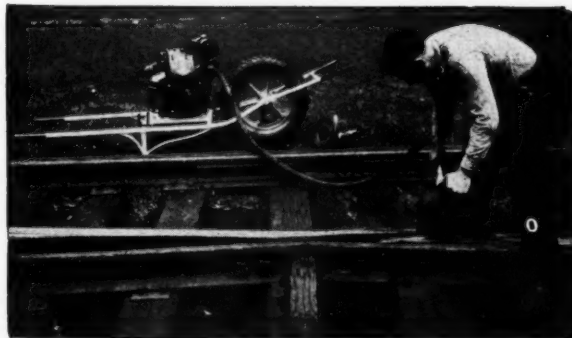
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Eliminates Weeds

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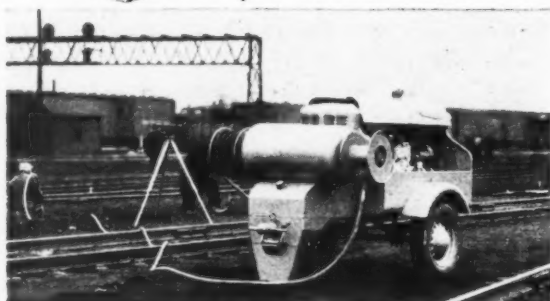
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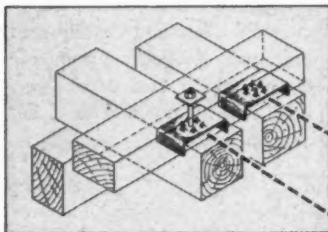


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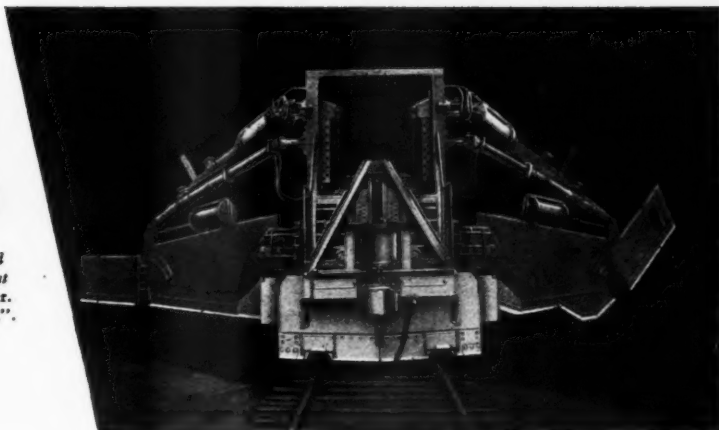
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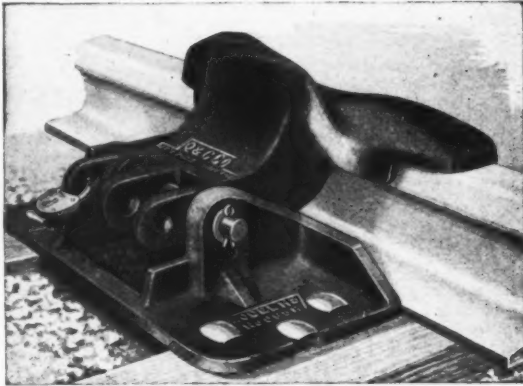
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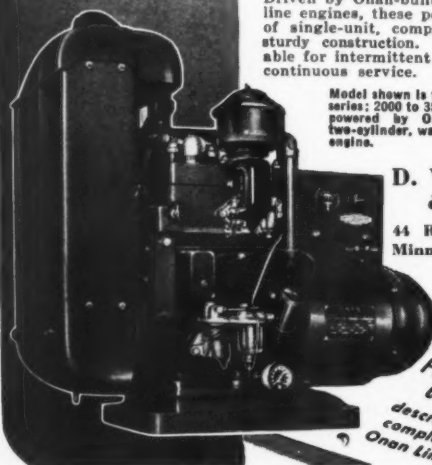


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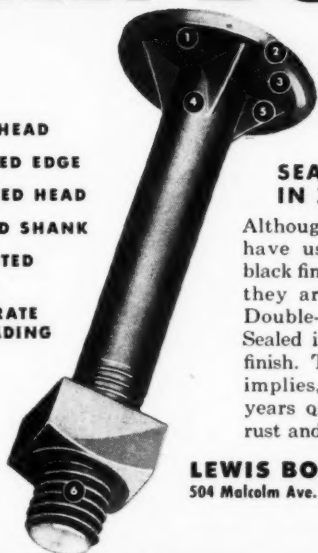
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See your supplier about details
and prices.



Model 2101

JUSTRITE MANUFACTURING COMPANY

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Track Maintenance



Just a few of the many features built into Burro Cranes are making track maintenance easier—are adding more "work power" to short-handed maintenance-of-way gangs.

They are:

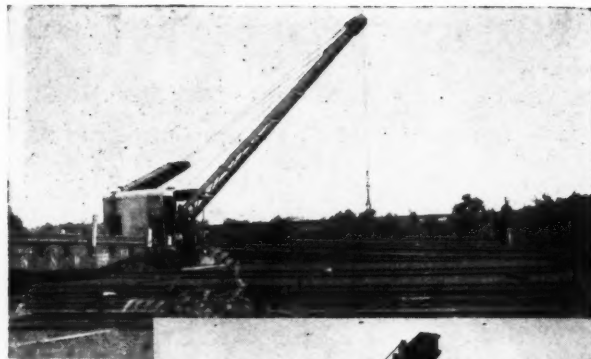
1. Short tail swing—enables Burro to work without fouling adjacent track
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4. Draw Bar Pull—up to 7500 lbs.—often eliminates use of work train

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Cullen-Friestedt Co., 1301 S. Kilbourn Ave., Chicago 23, Illinois.

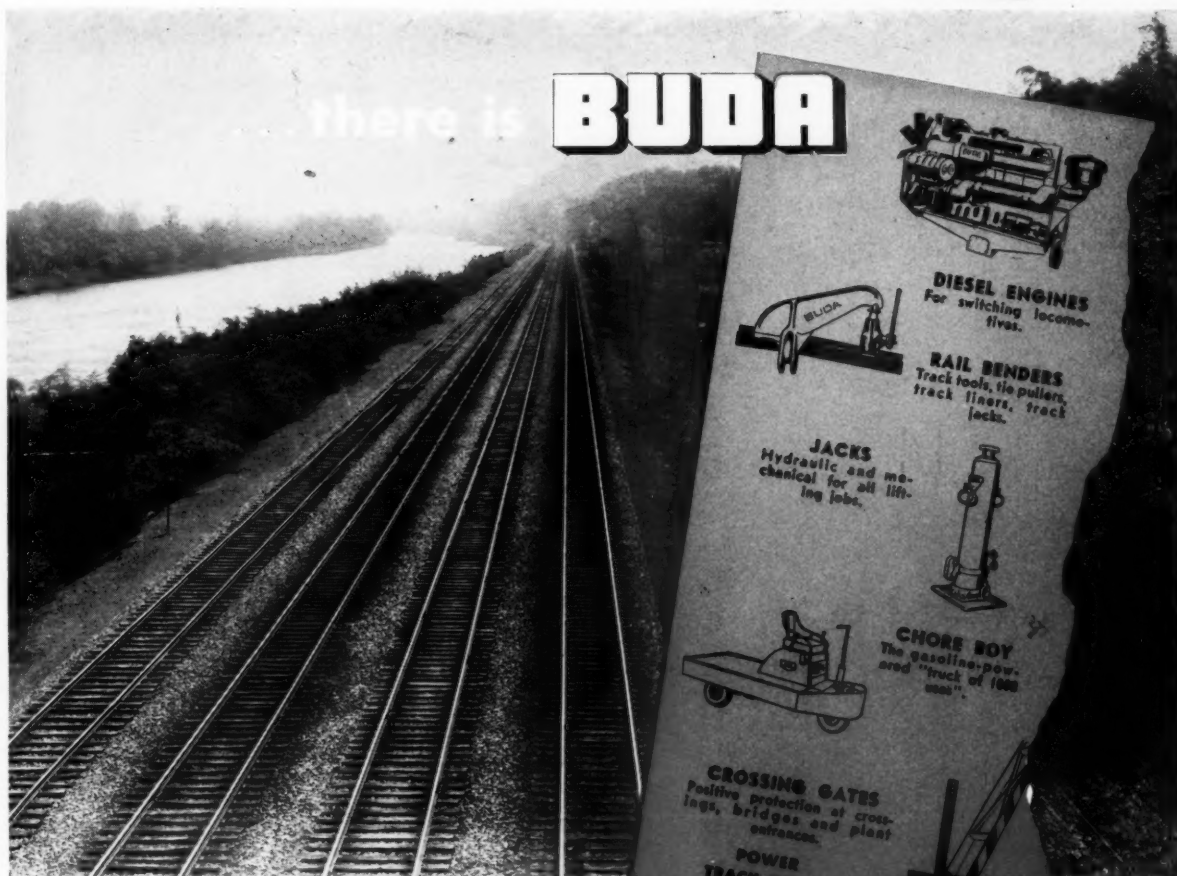
CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.



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